

News of the Industry Begins Page 322

# AUTOMOTIVE INDUSTRIES

LAND AIR WATER

Volume 68  
Number 10

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# AUTOMOTIVE INDUSTRIES

**AUTOMOBILE**

Volume 68

Reg. U. S. Pat. Off.

Number 10

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*Automotive Industries*

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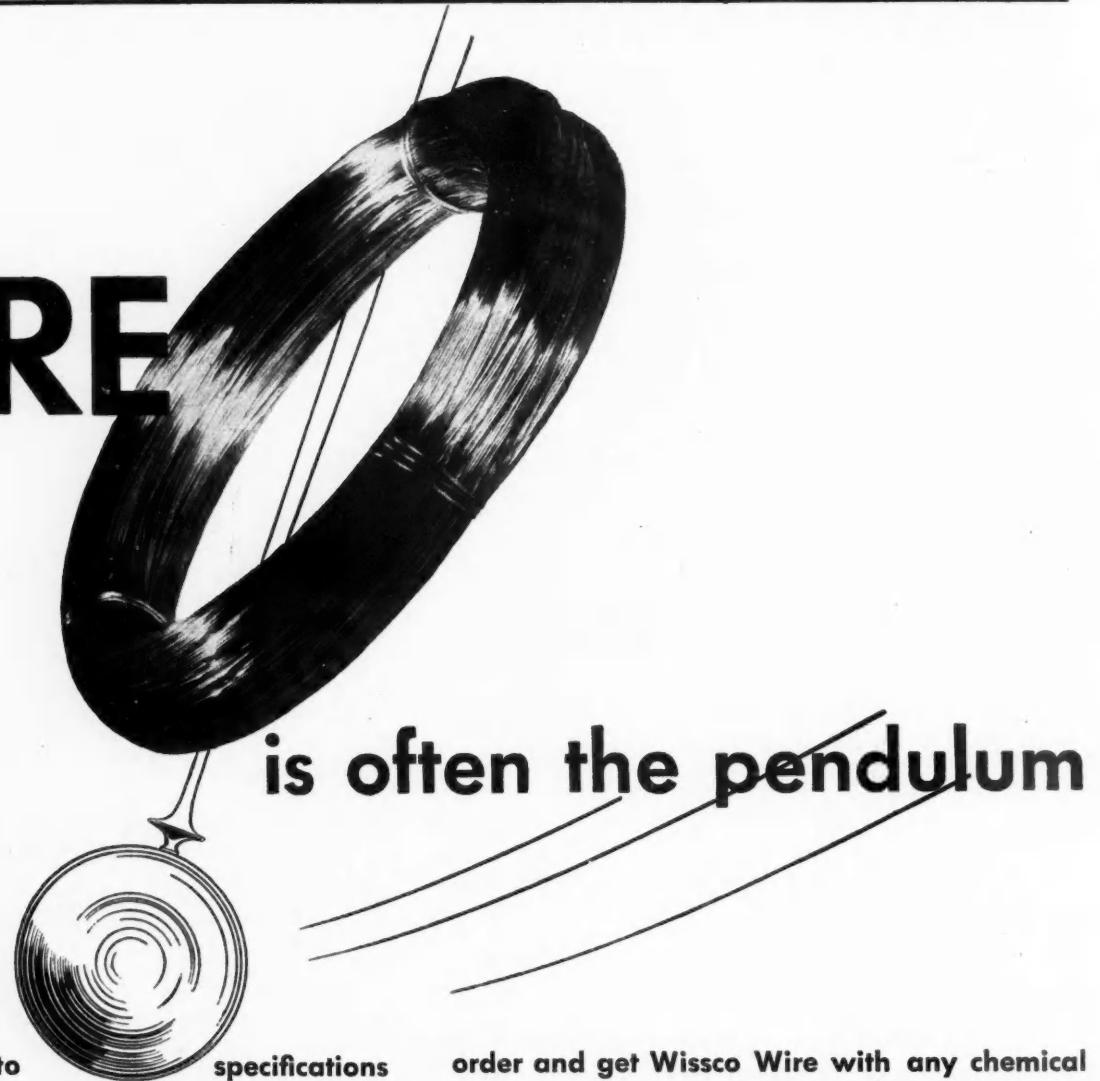


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**GENERAL ELECTRIC**

March 11, 1933

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# AUTOMOTIVE INDUSTRIES

Vol. 68, No. 10

• THIRTY-FIFTH YEAR •

March 11, 1933

## European Diesel Makers in Drive for Export Markets

Commerce Department  
Survey Reveals World-  
Wide Response to For-  
eign Builders' Efforts to  
Get Diesel Export Sales

by A. W. Childs

Chief, Automotive Division,  
Bureau of Foreign & Domestic Commerce,  
U. S. Department of Commerce

**S**TRENUOUS efforts on the part of manufacturers abroad to introduce and popularize Diesel-engined trucks and busses in many foreign countries are indicated by reports from American trade representatives overseas.

Not only are Diesel trucks being used or experimented with in the well known places of the world, but also in the smaller, more distant or undeveloped sections. From distant Ethiopia, a French firm has received an order for a truck to be used for experimental purposes in Ceylon, Java, Philippine Islands and Puerto Rico, a German company has secured some business in the Canary Islands, Iraq, India, Singapore and South Africa, the British are said to be making progress; in Palestine and Peru, the Swiss have sold a few machines; in China, The China General Omnibus Company (Shanghai) operates nearly 100 British Diesel-powered busses; while the Diesel type of vehicle is a commonplace on the streets of London, Paris and Berlin. In one of the cases cited, that of Java, it is reported that a dealer handling German vehicles took orders for 30 trucks within 30 days after obtaining that dealership.

European manufacturers of Diesel vehicles are approaching foreign governments,—federal, state and



A. W.  
CHILDS

municipal,—to interest those individuals charged with the purchase and operation of motor vehicles, and are reported to be making some headway. Also, there have been staged a number of reliability tours for demonstration purposes in export markets, and we find various evidences of distributors and dealers being named. In addition, we learn that engineers employed by European producers of Diesel vehicles are making special trips to various countries to superintend personally the setting up of their equipment and to see to it that it functions properly from the start. In one case, that of Canton, China, into which was sent a British Diesel engine expert, a Chinese official recently stated that this expert had offered to pay the entire expenses and Sterling £1.0.0. a week to promising

young Chinese engineers who will go to London and take a two year course in Diesel engines. It is apparent, therefore, that European manufacturers are building for the future even though the prospects may be remote in many cases. They seem to be taking the long range view of the situation, are preparing the way for the business hoped for when conditions improve, and are leaving no stone unturned in their determination to get in on the ground floor and become strongly entrenched to take advantage of the business available when and if this form of transportation is definitely accepted. Even in the most isolated spots, oil companies have let it be known that they are prepared to supply almost any type of Diesel fuel.

### World Awaits Automotive Diesel

It thus appears that the eyes of the world are on the manufacturer who can turn out a thoroughly satisfactory Diesel engine for application to automotive vehicles, at least such is the tenor of a number of reports from abroad. The high cost of gasoline in most foreign countries is a strong incentive to look for a vehicle which will operate efficiently on less expensive fuel. Whatever feeling there is in this regard has obviously been intensified by the economic depression which has ravaged most countries in recent years. The urge to experiment with any type of motor vehicle whose builders promise lower operating costs has been especially strong in countries where per capita wealth is low and where fuel costs have always constituted a major deterrent to the fuller development of motor transportation. With general economic conditions as they are, the world is interested even more than usually in low price fuel propulsion. In one country, Iraq, the cost of gasoline is  $7\frac{1}{2}$  times that of Diesel oil.

Just at this time when the idea of Diesel automotive transportation is in its infancy in many foreign countries, there is every reason for American makers of Diesel vehicles to keep abreast of the propaganda of our European competitors. The importance of foreign trade is clearly evident even in a year of acute depression. Automotive exports of all types in 1932 were valued at approximately \$82,000,000, and, if the Diesel-engined vehicle is destined to come into much wider use overseas, those American manufacturers who have entered the Diesel field should not overlook the potential prospects in foreign lands. In that connection, it is understood that some automotive Diesel engine builders in the United States are now manufacturing under foreign license, and may be restricted in their sales activities to certain markets.

At the time this is written, all of the vehicles offered in the United States are of relatively heavy capacities. European manufacturers likewise build heavy vehicles but apparently they are also making considerable progress in the development of light Diesels. Germany, France and England lead in that connection. In many export markets the condition of the highways precludes the possibility of using heavy machines, and our European competitors are not losing sight of this fact.

Up until late years the idea of applying Diesels to automotive service seems to have been considered more or less of a pipe dream. It is certain, however, that commercial vehicles of this type have been used for some time by European truck builders, but as regards actual results obtained, there seems to be little available in the way of reliable cost and performance data. In any case, if it is finally demonstrated that total

costs, including original outlay and general operating expenses, are in fact much lower in the long run than for gasoline vehicles, the savings effected will most certainly have a widespread appeal in foreign countries. Especially in sections where purchasing power is unusually low, this development is being watched carefully.

The tendency in some places is to import the engines separately and install them in used chassis, but difficulties have naturally arisen in that connection. We find that European engines have been imported into foreign countries and installed in used *American* chassis. In India there has been some talk of importing new chassis without motors, and some in the trade feel that manufacturers in a position to meet a demand of this sort may eventually develop a fairly substantial business.

In a number of countries, conditions have forced a keen interest in finding a cheaper fuel than has been available heretofore. While not strictly germane to the above subject, it might be mentioned that various experiments dealing with synthetic fuels have been made, and from two or three points we learn of tests of gas generators which convert ordinary wood into gas that is fed to high compression engines. While not as efficient, it is claimed that this equipment makes possible a saving of 75 per cent in fuel costs.

In many sections of the world, there seems to be a feeling of watchful waiting to see what the United States will do in connection with Diesel-engined trucks and busses. The prestige of American vehicles continues high abroad, and many foreign dealers feel confident that if the United States adopts the Diesel-engined vehicle for certain types of transportation, American manufacturers will turn out products equal or superior to the European vehicle in point of price and performance. In countries where motor vehicles are not produced, the future preferences and trends will obviously be determined primarily by what is offered and used in the manufacturing countries.

### Development is Closely Watched

There are, of course, many conflicting opinions as regards the present development and future potentialities of the automotive Diesel engine. Many feel that its usefulness in that regard is not yet clearly demonstrated, and that the whole matter is still in the experimental stage. Others, however, seem equally confident that it has come to stay, and much space is devoted to this form of automotive power in European publications. Because of the Diesel's success in other fields of transportation, the development of automotive units is being followed closely overseas.

Existing overseas dealers in American commercial vehicles, even in the most out-of-the-way places, are in an excellent position to determine the prevailing Diesel sentiment, and if this has not already been done, it is suggested that they be asked to keep their factories advised currently. If there is reason to feel that the Diesel-powered, commercial vehicle is destined to come into general use abroad, the maintenance of the American share of the world's automotive business will require the close attention of American Diesel vehicle interests to this subject. The headway made thus far in export markets by foreign manufacturers, in terms of actual sales, is not striking, but these many straws may show which way the wind is blowing and indicate a trend which may or may not presage the more general world use of Diesel type motor vehicles.

(Turn to page 319, please)

# JUST AMONG OURSELVES

## Streamlining With Front Engines

ONE streamlined body experimenter, who has been agreeing with most others that engines in the rear are almost certain concomitants of full streamlining, began to question his own thinking a bit the other day.

"Suppose you use a relatively short V-8 type of engine," he speculated, "then remove the front axle and have independent sprung wheels. Then you have removed one big space limitation; you can push your whole engine and body much further forward and come pretty close to getting a fully streamlined job, without increasing the wheelbase and without moving the engine away from the front. . . . It's worth thinking about anyhow—and would be more so if we had available an effective and suitable radial engine of some kind."

The rear-engine advocates, of course, will argue that streamlining possibilities are only one of many more important reasons for shifting the engine away from the front anyhow.

## Loomis Back on Job

ED LOOMIS, popular N.A.C.C. truck secretary, is going to begin spending a few days a week in his office again before long, everybody will be glad to know. Seriously injured in an automobile accident many months ago, he is definitely recovering and, although still on crutches, got down to greet many of his old friends at the Motor Truck Association of New

York's dinner a week or so ago.

Despite his absence, he has been actively following all the transportation and legislative developments.

## The Will to Do The Task Before Us

NEVER before have so many men been out of work in America. Never before in our own industry have so many able, competent executives been without jobs. Much has been written about the economic and financial toll which this condition takes from the country. But more important—though unmeasurable in any figures—is the psychological depletion from which many individuals will have trouble in recovering during a lifetime.

Brave faces are covering worried hearts today. The fight to keep up courage in the face of continued inability to find a position is tearing at the souls of men. You know some of them; we know some of them. And that courage must be kept up—for once it is gone, a man is gone—perhaps never to come back.

## Failure Opens Opportunity

PROF. G. F. WARREN of Cornell expressed an interesting viewpoint on this whole question when he said in a recent article:

"The man who has failed in business or is out of work is blamed for it, and he often blames himself. This is adding insult to injury.

"Most failures are due, not to unsound business, but to unstable money, for which no in-

dividual is to blame. The farmer or business man who has failed should not be despondent. He should feel like a man who has just gone through a tornado, been stripped of his property but escaped with his life. His family and his friends should treat him accordingly.

## Prices and Sales

TWENTY-THREE per cent of all show visitors at Chicago expected to buy a new car within six months, according to a survey conducted at the show by A. van Der Zee, Dodge g.s.m. Mr. van Der Zee considers that an encouraging proportion even though "economic conditions and the vagaries of human affairs will do their share in trimming the actual sales yield."

Be that as it may, to us the most interesting thing developed by the survey was that out of the 1000 persons questioned, 215 turned out to be non-owners. Only 78 out of every 100 show visitors, in other words, owned cars. That seems to us to be a fairly large proportion, particularly of a group interested enough in automobiles to pay money to go to see them.

Just what this indicates, we don't know, except that there is still a good market among people who don't own a car at all—which means a chance for some clean deals. It may indicate, too, that a very low-priced automobile with very low operating costs can tap a market which still wants transportation but just can't afford it.

And yet there is something in the remark made by the chief sales executive of a high-priced line that: "We have stopped trying to build automobiles to sell to the unemployed. We are building cars to sell to somebody who can buy." —N. G. S.

# New Standard Model Widens

**Coach Priced at \$455—Wheelbase Is 107 In. and 180.9 Cu. In. Engine Develops 60 Hp.—Design Similar to Larger Model**

**E**XPECTED for the past year by the trade, the new smaller Chevrolet model made its public appearance on March 11. Previously reported to be named the Chevrolet "Mercury," as was originally contemplated, the car carries the designation of "Standard Six" as compared with the "Master Six" for the larger Chevrolet model which is continued without change.

At the time of writing the important factor of price as yet remains undecided, but it is understood on good authority that the car will be listed between \$50 and \$100 under current Chevrolet prices. One factor which resulted in a price not as low as was generally expected is the decision of Chevrolet Motor Company apparently not to put major sales efforts behind the new car.

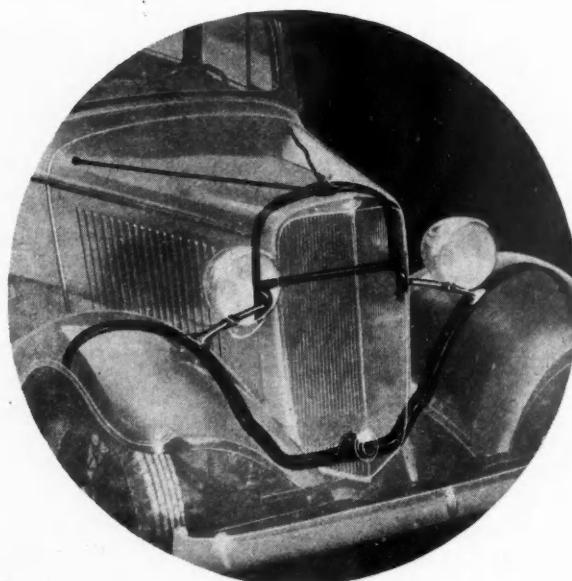
In the public announcement the statement is made that it is pointed primarily at the fleet market and for the commercial traveler requiring a car of low cost, and to W. S. Knudsen, Chevrolet president, is credited the statement that of Chevrolet's production for 1933, only about one-fourth will be represented by the Standard Six.

In general design, particularly in appearance, the car follows fairly closely the fundamentals of its larger brother. It is offered in three body types only, a two-door five-passenger coach and two coupes, one with and one without rumble seat, all on a wheelbase of 107 in., three inches shorter than the Master Six.

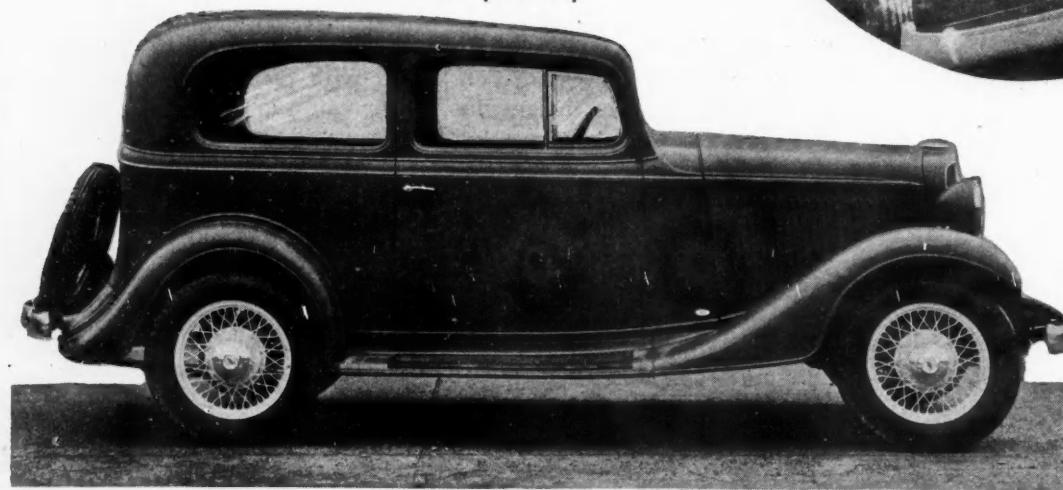
There is little interchangeability of parts between

the new car and the larger Chevrolet, the design being evidently intended to make maximum use of existing Chevrolet machine tool equipment rather than of parts. While the engine has the same bore of 3-5/16 in., the stroke is  $\frac{1}{2}$  in. shorter at 3-1/2 in., for instance, involving a new crankshaft, new connecting rods, etc.

In fact, only a few minor parts, such as valves and piston rings, appear to be interchangeable. Design however follows quite closely the larger engine. The new powerplant is of the same valve-in-head type with cast iron, bronze-bushed pistons, integrally counterweighted crankshaft, downdraft carburetor, centrifugal and vacuum spark advance control, semi-pressure oiling system, combination intake silencer and air-cleaner and octane selector. Accompanying specifi-



Phantom view of the independent fender and radiator mounting on the Standard Six (similar to Master Six practice)



Chevrolet Standard Six Coach on a 107-in. wheelbase

# Chevrolet Market

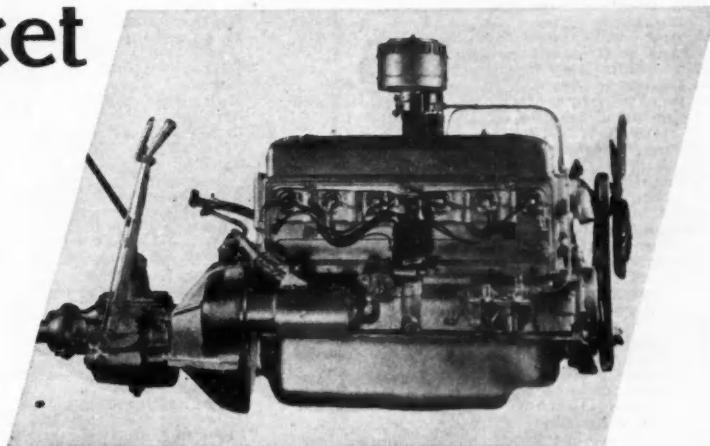
By Athel F. Denham

Field Editor, Automotive Industries

cations show the major dimensions of the new engine parts. Engine mounting is of the "diamond" type similar to that used on the 1932 Chevrolet, with two supports at the clutch housing, one at the front, and one back of the transmission under the front universal, to steady-rest the torque tube drive—all mountings being rubber insulated.

While the new clutch carries the same facing sizes as on the Chevrolet Master Six, the structure differs in detail to take care of the changed torque characteristics. Transmissions are of completely different design only in that they do not incorporate either a synchromesh or freewheeling device. They are of the three-speed type with helical constant mesh gears for countershaft drive at the front, and for second-speed operation at the rear of the transmission, with helix angles opposed to neutralize thrust. Engagement is by a sliding sleeve on the splined main shaft for easy engagement by means of clutch teeth for direct and second speed.

Shifter forks operate between flat surfaces, with spring loaded ball type detents, and an interlocking plate to prevent movement of both forks at the same time. Pumping action of the clutch gear and countershaft driven gears conveys lubricant through a hole in the clutch gear to the front mainshaft bearing. Second-speed mainshaft gear is lubricated in the same manner for idle running condition on the mainshaft directly. Transmission bearings are New Departure front and rear and Hyatt roller pilot for the mainshaft, and bronze



Chevrolet Standard Six powerplant

## Comparison of Master and Standard Models

### PRICES

	Master	Standard
Coach	\$515	\$455
Business coupe	495	445
Coupe with rumble seat	535	475

### WEIGHTS

Coach	2835	2425
Coupe	2730	2335
Coupe with rumble seat	2795	2395

### MAJOR SPECIFICATIONS

Wheelbase	110 in.	107 in.
Front tread	57 9/16	54 in.
Rear tread	57 9/16	56
Number of cylinders	Six	Six
Bore and stroke	3 5/16 x 4	3 5/16 x 3 1/2
Piston displacement	206.8	180.9
Compression ratio	5.2	5.2
Maximum horsepower	65 at 2800	60 at 3000
Horsepower per cubic inch	0.314	0.331
Piston speed at peak load	1865 ft. per min.	1750 ft. per min.
Brake mean effective pressure	88.9	87.6
Main bearing projected area	12.37	12.9
Maximum engine torque	128 lb.-ft.	125 lb. ft.
Pounds per horsepower (coach)	43.6	40.4
Pounds per cu. in. displacement (coach)	13.7	13.4
Displacement factor, cubic inches, under gas pressure per ton per foot (with 300-lb. load) coach	37.7	39.4
Total brake area	128.4 sq. in.	91.5 sq. in.
Frame rail section	5 1/4 x 9/64 x 2 1/4	5 5/16 x 1/8 x 1 3/4
Section modulus of frame rail	3.29 in. <sup>3</sup>	2.59 in. <sup>3</sup>
Steering ratio	14:1	14:1
Tire size	5.25/18	5.25/17
Fuel capacity	4 gal.	11 gal.
Front springs	36 x 1 3/4 x 7 leaves	33 x 1 3/4 x 6 leaves
Rear springs	54 x 1 3/4 x 8 leaves	54 x 1 3/4 x 8 leaves

## Specifications of the Chevrolet Standard Six

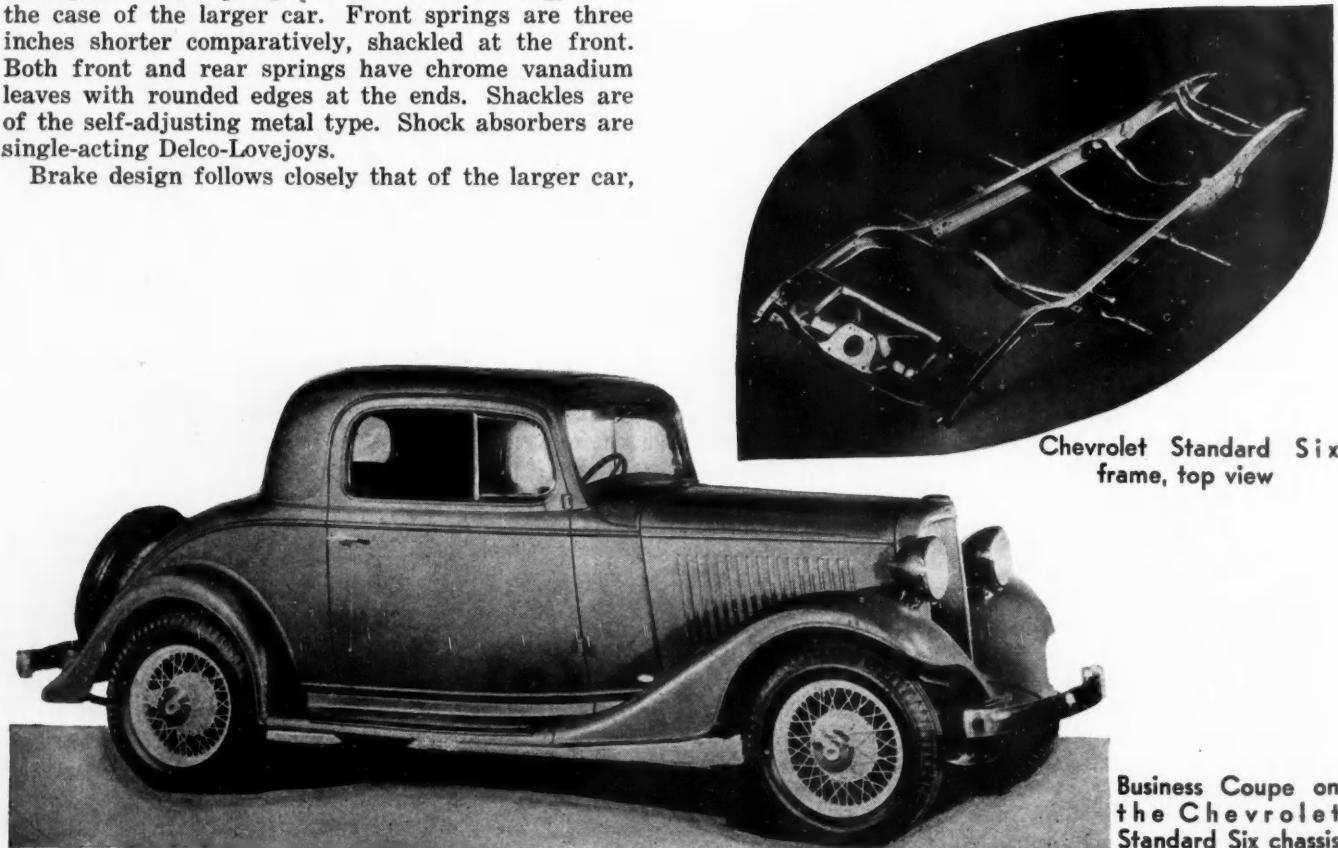
Taxable horsepower	26.3
No. points suspension	4
mounting type	rubber
Crankcase capacity	5 qts.
Crankshaft counterweighted	Yes
No. main bearings	3
Diameter, front	2.059
length, front	1 1/4 in.
Center, diameter	2.121
length	2 1/4
Rear, diameter	2.184
length	2.490 in.
Crankpin diameter	2 1/8 in.
length	1 1/2 in.
Main bearing type	steel backed
Connecting rod length	6.531 in.
lower bearing	spun in.
Piston material	Cast iron
No. of rings	3
Compression	2-5/32
Oil control	1-3/16
Piston pin diam.	.990 in.
Valves, intake	
head diameter	1-29/64
exhaust head diam.	1-11/32
stem diameter	.325
overall length	4.939
Camshaft bearings	3
Camshaft drive	Compos. gear
Valve timing,	
intake opens	4° BTDC
intake closes	34° ABDC
Valve lift	.314 in.
Water pump location	cylinder head
driven by	fan belt
Oil pump type	vane
avg. oil pressure	14 lbs.
Spark plugs make	A.C.
type	K-9 (14mm.)
Spark control	cent if. & vac.
Max. autom. advance	.32 deg.
additional vacuum adv.	.12 deg.
Carburetor type	Downdraft
make	Carter
Man. heat control	on dash
Air cleaner	Yes
Intake silencer	Yes
Clutch type	single plate
Facing, outside diam.	.9 in.
inside diameter	6 1/4 in.
thickness	5/8 in.
No. used	2
Facing type	Braided, molded
Hub mounting	coil springs
Release bearing	moulded graphite
Transmission type	three speed helical
ratio, low	.280
second	.71
reverse	.280
Mainshaft on	New Departure Ball
pilot	Hyatt roller
Countershaft	bronze bushings
Synchromesh	No.
Freewheeling	No.
Universal	Yoke, metal
Propeller shaft	solid in torque tube
Rear axle	semi-floating
ratio	.41 to 1
Housing	pressed steel
Pinion bearings	New Departure Ball
Differ. bearings	New Departure Ball
Axle shaft bearing	Hyatt roller
Pinion adjustment	shims
Axle shaft diam.	1 7/32 in.
Brake types	Mechanical
Drum diameter	.10 in.
Lining, width	1 1/2 in.
Length, short linings	.5 9/64 in.
long linings	.10 7/64 in.
Emergency operates	service brakes
Spring material	chrome vanadium
Front springs shackled at	front
Kick shackle?	No.
Shackles type	metal
Drive taken through	springs
Torque taken through	torque tube
Shock absorbers	Delco Lovejoy
type	single acting
Front axle type	I beam
ends	Reverse Elliott
Caster	2 1/4 deg.
wheel camber	1 1/2 deg.
king-pin camber	.7 1/6 deg.
Wheel bearings	Ball
Steering gear make	own
type	worm and sector
turning circle diam.	.37 ft.
Exhaust pipe diameter	2-1/16 in.
Fuel feed	A.C. pump
Rims type	drop center
width	3 in.
Wheels type	wire
diameter	.17 in.
Headlight lens diameter	.8 11/32 in.
Battery make	Delco
amp. hrs.	.90
Starter pinion, teeth	.10
flywheel teeth	.104
engagement	Bendix
Starter motor model	.714-L
Generator model	.943-J
Start. & gen. make	Delco-Remy
Radiator capacity	10 qts. (total)

bushings for the countershaft and reverse idler.

Universal joints are assembled as a unit to the transmission and removable as a unit as on the Master Six. It follows the same design as on the larger car. Torque tube and rear axle also follow the design used in the Master Six, but are considerably lighter. Moreover the tread for the rear axle is 56 in. as compared with 57½ in. for the Master Six. Drive is taken through the rear springs which are 54 in. long, as in the case of the larger car. Front springs are three inches shorter comparatively, shackled at the front. Both front and rear springs have chrome vanadium leaves with rounded edges at the ends. Shackles are of the self-adjusting metal type. Shock absorbers are single-acting Delco-Lovejoys.

Brake design follows closely that of the larger car.

the principal difference being in the drum diameters and width of lining. Proportionately smaller parts are used on the standard six, making for low unsprung weight. The same "cut-in" system for the hand brake is also used, effective on all four wheels.



## Chevrolet Standard Six frame, top view

## Business Coupe on the Chevrolet Standard Six chassis

**Section through transmission**

Front axle tread is 54 in., for maneuverability. Here again Master Six design is followed, but parts are lighter in proportion. Ball bearings are used for the king pin thrust. Steering gears are similar to units used on the Master Six, but with a reduction of 14 to one.

Frames are of conventional Chevrolet design with five cross-members, and tapering uniformly from front to rear. It has a double kick-up over the axles for low body height. Side members have embossed panels at heavily loaded sections to distribute stresses. All cross-members are of the stamped steel type. Front cross-members are similar to those on the Master Six; the rear engine cross-member is like that used on the 1932 Chevrolet, as is the transmission support cross-member. Running board front hangers are integral with this member.

The fourth member is located at the beginning of the rear axle kick-up and is provided with sturdy diagonal braces to the side-rail at the rear spring front hanger bracket. 1933 Master Six design is followed in the rear cross-member. Bumper brackets are integral with frame horns.

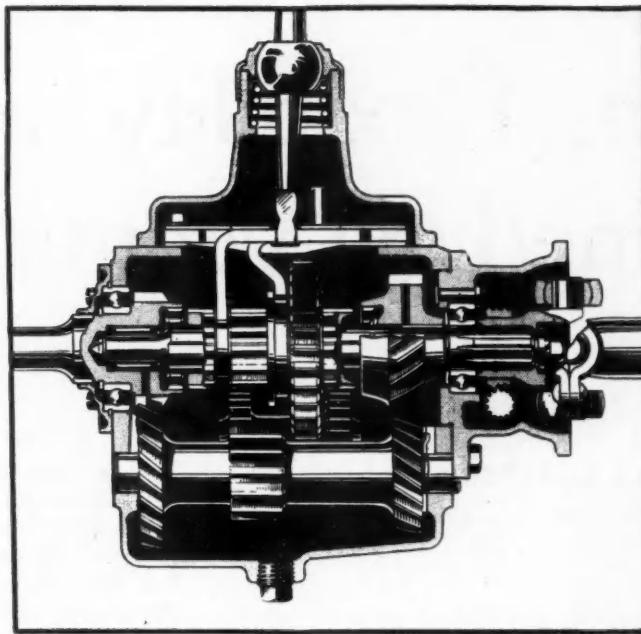
The exhaust system consists of a baffle-type muffler supported in rubber insulated brackets as on the Master Six, there being a secondary spring support about midway of the exhaust pipe to permit motion in unit with the powerplant.

The fuel system incorporates the usual AC fuel pump. The gasoline line is carried outside the frame for vapor-lock protection, and an electric fuel gage is provided. Starter control is of the foot-operated type as on the 1932 Chevrolet, the starterator not being used on the Standard Six.

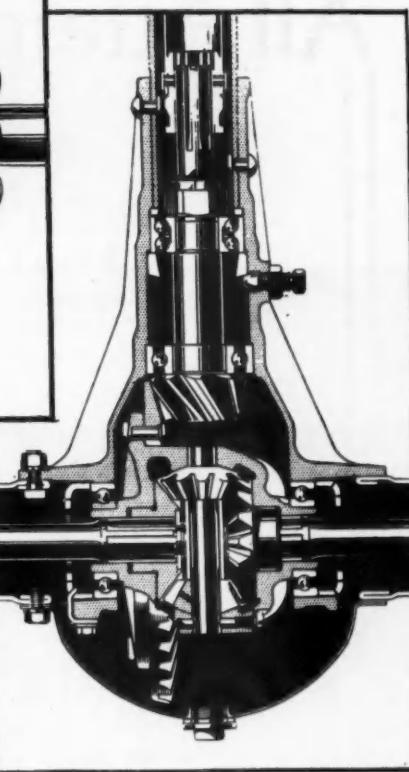
The Standard Six carries smaller, 17-in. wire wheels, with 5.25-in. section tires. Spare tire carrier is at the rear, with no fender well options, it is understood.

Body sheet metal is similar in general design to that used on the larger car, with slightly sloping grilles, radiator front, valances on front and rear fenders, double curvature rear body panel, and curved running boards. Hood louvers are of the conventional type, a distinguishing mark from the larger Chevrolet model. Radiator shells are lacquered to match body colors.

The instrument panel is simple in design and includes a speedometer at the left, combination oil pressure and gasoline gage at the right, ammeter in the center with choke and throttle controls to either side, all of the pointer type and coil type ignition lock below. The light switch is at the left of the panel. There is a combination tail and stop light, and headlights are of the twin-beam type.



**Section through rear axle**



Fisher no-draft ventilation is an important item of equipment in the new car as on all other General Motors lines, the windshield being fixed and sloped backward. Safety glass is used in the windshield. There is a cowl ventilator, windshield wiper motor is concealed, internal door locks are of the new-button type used on the Master Six, front seats are slide-adjustable; all hardware is chrome plated, and sun visors are provided in front of the driver.

The Standard Six taken as a whole should prove to have outstanding performance characteristics, judging from specifications, particularly in the case of acceleration, there being a greater proportionate decrease in weight than in torque and horsepower, while rear axle ratio is the same as in the Chevrolet Master Six, 4.11 to one.

**Adam Opel Co. Cancels Contract**

Vice-consul Zawadzky reports from Berlin that the Adam Opel Company of Russelsheim (the G. M. subsidiary) has cancelled the contract concluded at the end of 1931 with the Steyr-Werke of Austria. According to this contract, the Steyr concern restricted its production of automobiles in return for a share in the construction of the Opel machines. The carrying out of this contract met with considerable difficulties as a result of foreign exchange regulations. It is regarded as probable that the Steyr-Werke itself will commence the construction of a small passenger model.

# Precision, Flexibility and Low All Attained in Lycoming Motor

By Joseph Geschelin  
Engineering Editor, Automotive Industries

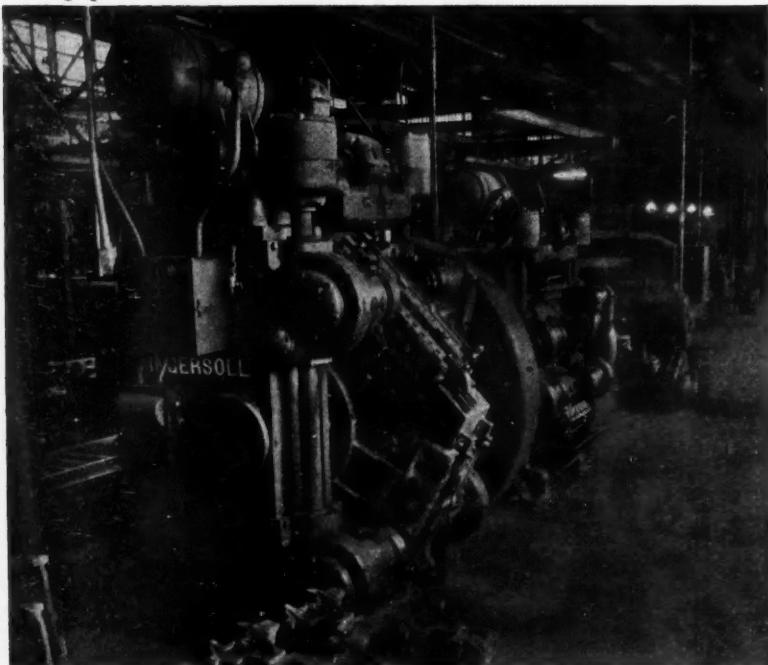


Fig. 1. Five-spindle, drum-type Ingersoll roughs and finishes top and bottom faces of 8-cylinder block in one pass

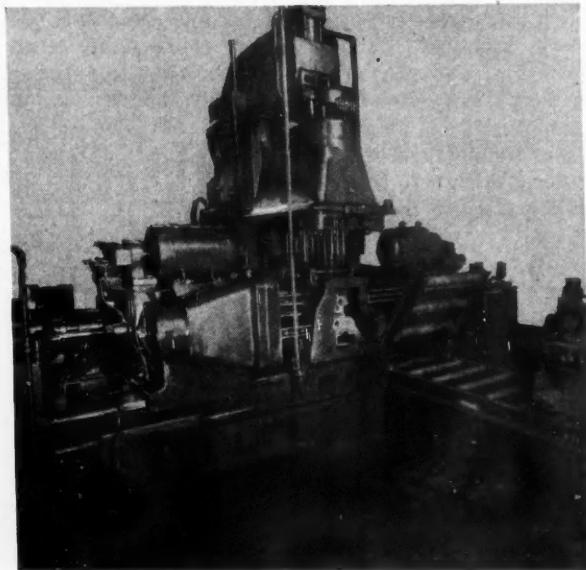


Fig. 2. One of the four, three-way multiple head Baush driller and tappers in the 8-cylinder line. This driller has 83 spindles. It is arranged at right angles to the conveyor line and provided with a fixture which permits the work to feed through

MILES from the automotive scene but right on the spot when it comes to building engines. That's our impression after making the rounds of the production lines that create the well-known 8's and 12's for the Lycoming Mfg. Co.

Two separate lines form the backbone of the machine shop: an outer high-production group for the 8's, clear for action, and an inner low-production group for the 12's. Details of both provide the background for this article.

On the evidence of the available data as well as a personal inspection of the equipment, it seems that this factory organization has achieved three much sought-for objectives—precision in the maintenance of close tolerances, flexibility of equipment, and low manufacturing costs.

Perhaps the most striking examples of precision are found in their practice of using single-purpose instead of multi-purpose tool bits, and the subdividing of operations over a battery of machines. Thus, on the valve seat and valve stem bore group, the operations are specialized and spread over a battery of five multiple-spindle machines. Near the end of the eight-cylinder line, we find that the steps between rough boring and final reaming of cam and crank bores are spread over a battery of four horizontal boring machines. The final finish at this point is held to 0.0005 in.

Flexibility to an unusual degree is achieved through the selection of variable center boring and drilling equipment and unit-type, multiple-head drills and milling machines. As a matter of fact, it is estimated that the productivity of certain sections of the eight-cylinder line could be tripled merely by

# Cost Plant

increasing the crew of operators.

Economy comes from the use of full or semi-automatic cycles, quick-acting hydraulic mechanisms, complete mechanization of all materials handling, and skillfully designed work holding fixtures provided with automatic clamping devices.

Lycoming is one of the largest users of cemented-carbide and other hard cutting materials. These tools are used liberally on the 12-cylinder line in milling cutters of all sizes. In accordance with best current practice, the special tools are cleared through a central tool room and are handled exclusively by a trained operator. Tools are tipped and



Fig. 3—Boring of cam and crank bearings is sub-divided in four Ingersoll boring mills forming a corner of the 8-cylinder line. Blocks are raised to the level of the platen by means of the hand-operated fixture located at the corner

Fig. 4—Pressing in the 16 valve guides is child's play when this Oilgear press gets to work. This view shows the 16 red tell-tale lights blazing away. They go out only if and when the valve guide is of the right size. Truly an automatic inspection

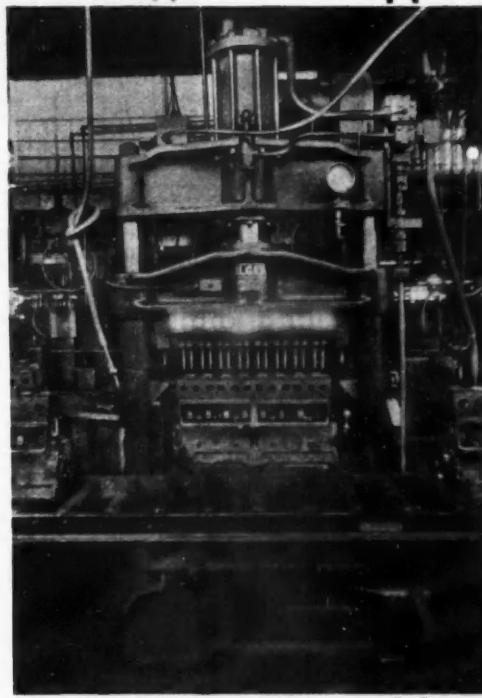


Fig. 5. Looking down a line of Cincinnati Hydromatics forming the backbone of the 12-cylinder line. The 8-cylinder line is seen to the right. This is the section with the tricky conveyor sections described in the article



brazed and ground from rough to finish. The department is equipped with a special grinder for this purpose and has facilities for salvaging old or broken tool tips.

One of the most interesting features of the machine shop is a novel installation of ball-bearing roller conveyors. Not only are the machines connected by the conveyor in the customary fashion, but on the 12-cylinder line they have worked out special sections consisting of turn-tables, wheeled carriages, and the like.

Following the practice which Lycoming established in its foundry several years ago, the two final assembly lines are in the form of a merry-go-round consist-

ing of a large number of special fixtures rolling on an oval track. It is remarkable how much time and productive floor space are conserved through this device.

In getting down to details of the production lines, we have arranged the following descriptive material so as to cover each line separately. For convenience and also because it is the major line, we shall take a trip around the eight-cylinder department first.

Perhaps the most convenient way of picturing this operation is to high-spot some of the points of interest as we go step-by-step along the routing detailed in Table 1. Needless to say these high spots are of the writer's choosing and do not imply that they are of greater importance than the gamut of other operations.

The first group in this line is shown in Fig. 1, the first machine being the familiar five-spindle Ingersoll drum-type miller, which rough-and-finish-mills the top and bottom faces in one pass. The next two in

line are respectively a five spindle and a three-spindle Ingersoll handling operations 3 and 5.

Loading the heavy cylinder block on the first two Ingersoll mills was quite a problem. Early efforts to spot the work accurately in the fixture were not satisfactory since it became necessary to stop the machine each time. The solution arrived at was a combination hydraulic and electric hoist mechanism, the cylinder of which is shown at the left in Fig. 1. One man can spot the work accurately and, if needed, can "inch" the casting rapidly into place by means of the electric control. Moreover, this can be done with the machine running.

Following along the line, we come to the first corner formed by a battery of five Baush vertical drills equipped with Oil-gear center feed, straight-line, multiple spindle heads. These machines handle operations 12 to 16 inclusive, the first being provided with eight 2-in. spindles, the others having 16 1/2-in. spindles each. To assure accuracy, these machines are designed for great rigidity so that despite their compact size each one weighs in excess of 20,000 lb.

As these operations produce a lot of chips, after operation 14, a station is introduced for chip removal prior to the final reaming. What they do in effect is to set an air manifold on top of the block, thereby blowing out the chips in every valve opening simultaneously.

Fig. 2 illustrates one of the four three-way, multiple-head Baush drillers and tappers. The drill units have the three-way Oilgear center feed, while the tapping units operate with three-way lead screws. Fig. 2 is at operation 18 and typifies the through feed arrangement whereby the work is passed right through the throat of a machine without interrupting the straight line movement. This machine has 83 spindles. Note the counterweighed leaf in the conveyor which provides for a passageway at this point to facilitate working around the machine.

At the second corner of the line, which is in the

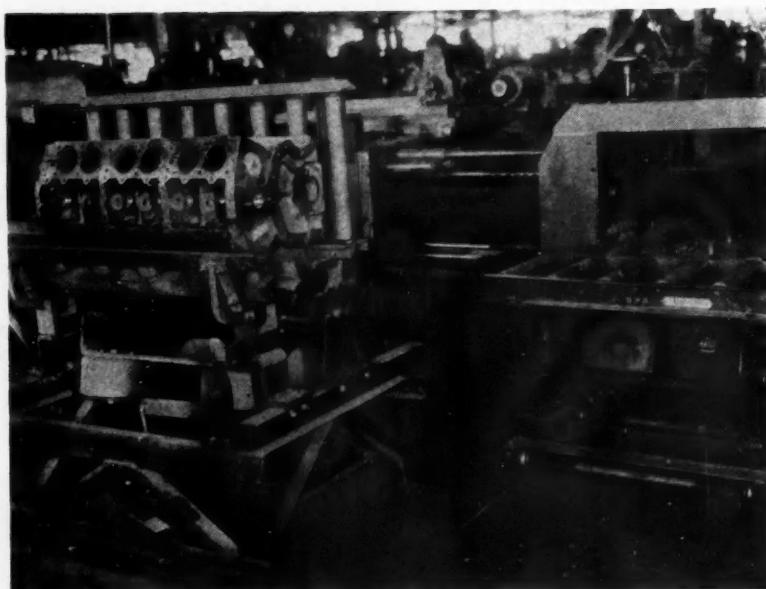


Fig. 6—Here is the method of transferring the block from a Cincinnati miller to the Natco which drills the rocker arm shaft bearings. Comes out on its side, is turned upright, and wheeled over to the driller on the carriage

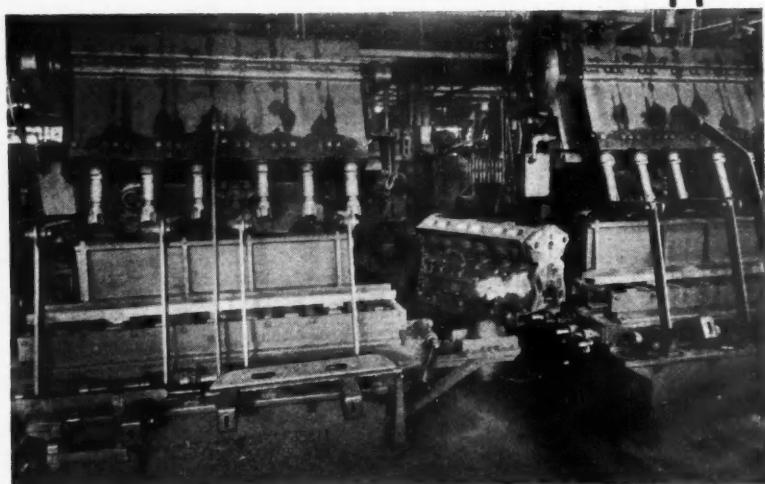


Fig. 7—One of the first production boring machines with variable centers, adjusted by spacers, and designed for cemented-carbide tools. This is a six-spindle inclined Moline Hole Hog

form of an open rectangle, we find the group of four, two-spindle, semi-automatic Ingersoll horizontal boring machines (Fig. 3), used for boring the cam and crank bearings, operations 29 to 32 inclusive. The cycle of each machine is the same. After the block enters the platen, the operator starts the machine through its cycle. The platen raises the block into position and clamps it in place automatically. The bars are run into the cutting position and then start revolving. After feeding through they stop automatically and are withdrawn, whereupon the block is released and the platen lowered to the loading position. Stellite flycutters are used for roughing, while cemented-carbide tips are employed for finishing cuts.

Note the elevating section of the conveyor at the corner which raises the block to the level of the plate by a single throw of the big lever.

Near the end of the line at operation 36, we find the unusual type of machine shown in Fig. 4. It is an Oilgear hydraulic press which automatically presses in the 16 valve stem guides in one stroke. Sixteen tell-tale lights blazing away here act as an automatic inspector. If the guides go in with the required fit and pressure the lights go out; if one or more are

undersize, the red light stays on at the offending points.

This completes a fleeting glimpse of the eight-cylinder line with a close-up of five stations. Space does not permit a more detailed view. However, before leaving this section of the plant, it is interesting to observe that manual handling of the block has been almost entirely eliminated. Movement is in a continuous line, through machine tables built in the conveyor line. At two or three points, the block is turned to suit the nature of the operation by means of roll-over fixtures.

Now the 12-cylinder line is built inside of the open rectangle formed by the eight-cylinder line and runs parallel to it all the way around. It is provided with an entirely different type of equipment in keeping with a lower production demand. Let's follow it around with the aid of the routing detailed in Table 2.

A good view of the first section of the 12-cylinder line is afforded by Fig. 5, paralleled on the right by the eight-cylinder line discussed above. With the exception of operations 3 and 4, the group of operations from 1 to 8 inclusive is handled by Cincinnati Hydromatic milling machines. The entire line is interconnected by unique, specialized roller conveyor devices supplied by Mathews.

Some of these conveyor sections are pivoted, others fixed, the arrangement depending entirely upon the speed of the operation. For example, the machine in the foreground has a conveyor section with room for two blocks; further up is one with provision for holding four blocks. A Cleveland electric Tramrail installation at the beginning of the line takes care of the lifting of the heavy block and facilitates the loading for the first operation.

The Cincinnati millers are of unit-type construction and are capable of producing about double the present rate of output. Tooling used is as follows:

- Oper. 1—Two 6½-in. Carboloy cutters, one 6¾-in. Stellite
- Oper. 2—Two 6¾-in. Carboloy cutters, one 6¾-in. Stellite
- Oper. 5—Two 7-in. and two 5½-in. Carboloy cutters
- Oper. 6—Two 7-in., one 4-in., and one 5½-in. Carboloy
- Oper. 7—Two 18-in. Stellite cutters
- Oper. 8—Six 6-in. HSS cutters.

The machines for operations 1 and 2 are provided with an automatically controlled variable feed rate which makes possible a maximum rate of 18 in. per min. when only the Carboloy cutters are engaged, and a minimum rate of 12 in. per min. when all the cutters are engaged.

As an example of the ingenuity employed in mechanizing the handling of work from machine to machine, consider the arrangement in Fig. 6. Here the block is shown as it leaves operation 8, straddle-milling main bearings on a plain Cincinnati Hydromatic, the block being presented to the cutters on its side. But in the next operation, No. 9, it is required to drill the rocker arm shaft bearings with the block set vertically in the Natco shown in the background.

The way it's done is to deliver the block to the counterweighted, pivoted table at the exit end of the miller, where it is turned to a vertical position by tipping the table to the rear. Then the carriage shown at the right is wheeled forward to receive the block and wheeled back to the driller to permit the

## TABLE I

### Group "A," Oper. No. 1 to 4 Incl., 2 Men

Oper. No.	Name of Operation	Mach. Type
1.	Rough and finish mill oil pan and cylinder head side	Ingersoll
2.	Drill and ream locator holes	Baush
3.	Rough and finish mill front and rear end	Ingersoll
4.	Finish mill water back and front supports	Cinc

### Group "B," Oper. No. 5 to 11 Incl., 3 Men

5.	Rough and finish mill bearing locks	Ingersoll
6.	Drill main oil line	Rockford
7.	Straddle mill bearings	Ingersoll
8.	Mill fuel pump and oil relief pads	Ingersoll
9.	Rough bore barrels	Moline
10.	Mill tappet cluster face	Ingersoll
11.	Finish bore and ream barrels	Moline

### Group "C," Oper. No. 12 to 16 Incl., 2 Men

12.	Cut valve seats	Baush
13.	Bore valve throats, start bore valve stem guides	Baush
14.	Drill valve stem guides	Baush
15.	Ream valve throats to size, line ream valve stem guides	Baush
16.	End ream valve stem guides	Baush

### Group "D," Oper. No. 17 to 24 Incl., 3 Men

17.	Drill front and rear end, cylinder head face and tappet cluster stud holes	Baush
18.	Drill manifold and water back sides, drill water holes on cyl. head face	Baush
19.	Drill dowel holes, tappet cluster pads, ctsink stud holes on top, drill breather hole and oil gage hole	Baush
20.	Tap front and rear end, cylinder head face and tappet cluster stud holes	Baush
21.	Drill dowel holes, oil pan holes, oil holes to main brgs. and long oil line to main brgs., drill front support arms	Baush
22.	Drill reaming oil pan holes, start drill angular oil holes, drill bearing cap stud holes	Baush

Oper. No.	Name of Operation	Mach. Type
23.	Tap angular oil holes	Baush
24.	Tap manifold, water back and oil pan side	Baush

### Group "E," Oper. No. 25 and 26, 1 Man

25.	Drill angular oil hole to cam bearings	Avey
26.	Water test	Fixture

### Group "F," Oper. No. 27 and 28, 2 Men

27.	Drive dowel pins, clean out stud holes for brg. caps	Bench
28.	Assemble bearing caps	Bench
28A.	Core bore main and cam bearings	.....

### Group "G," Oper. No. 29 to 34 Incl., 3 Men

29.	Rough bore main and cam bearings	Ingersoll
30.	Semi-finish bore main and cam bearings	Ingersoll
31.	Finish bore main and cam bearings, ream dowel holes in rear end and ream for expansion plug on cam bearings	Ingersoll
32.	Line ream main and cam bearings	Ingersoll
33.	Chamfer cylinder barrels	Ingersoll
34.	Drill and ream oil pump hole	Cinc.
35.	Finish ream barrels	Baker

### Group "H," Oper. No. 36 and 37, 1 Man

36.	Press valve stem guides	Ingersoll
37.	Ream valve stem guides	Avey

### Group "I," Oper. No. 38 and 39, 2 Men

38.	Rough lap barrels	Moline
39.	Finish lap barrels	Moline

### Group "J," Oper. No. 40 and 41, 2 Men

40.	Oil test	Fixture
41.	Wash	.....

## TABLE 2

Group "A," Oper. No. 1 to 9 Incl., 4 Men		
Oper. No.	Name of Operation	Mach. Type
1.	Rough mill oil pan side and bearing locks	Cinc.
2.	Finish mill oil pan side and bearing locks	Cinc.
3.	Drill locator holes	Cinc.
4.	Straddle mill rocker arm bearings	Rockford
5.	Rough mill cylinder face and water back sides	Cinc.
6.	Finish mill cylinder face and water back sides	Cinc.
7.	Straddle mill front and rear end	Cinc.
8.	Straddle mill main bearing locks	Cinc.
9.	Drill rocker arm shaft bearings and main oil line	Natco
Group "B," Oper. No. 10 to 18 Incl., 4 Men		
10.	Rough bore cylinder barrels	Moline
11.	Finish bore cylinder barrels	Moline
12.	Drill cylinder head stud holes	Baush
13.	Drill cylinder head water holes	Baush
14.	Drill reaming head holes and ctsink, drill rocker shaft dowel holes	Cinc.
15.	Tap cylinder head stud holes	Baush
16.	Drill water back side	Baush
17.	Tap water back side	Baush
18.	Assemble water test plugs	Bench
Group "C," Oper. No. 19 to 27 Incl., 4 Men		
19.	Water test	Fixture
20.	Drill fuel pump, oil gage and oil relief holes	Avey
21.	Ream fuel pump, oil gage and oil relief holes, tap fuel pump and purulator pad	Avey
22.	Finish drilling holes not obtainable on Oper. No. 20 and 21	Cinc.
23.	Drill oil pan side and bearing cap stud holes	Baush
24.	Drill bearing cap dowel holes and oil pan bolt holes	Baush
25.	Ctsink and drill oil lines	Cinc.
Oper. No. Name of Operation		
26.	Tap oil pan bolt holes and main bearing stud holes	Baush
27.	Finish drill main bearing oil lines and drill cam oil lines	Carlton
Group "D," Oper. No. 28, 2 Men		
28.	Insert 8 dowels and assemble bearing caps	Cinc.
29.	Core drill cam bearing	
Group "E," Oper. No. 30 to 39 Incl., 7 Men		
30.	Rough bore main bearings	Rockford
31.	Semi-finish bore main and cam bearings	Rockford
32.	Flycut main and cam bearings	Rockford
33.	Finish ream main and cam bearings	Rockford
34.	Assemble cam bearings	Bench
35.	Remove bearing caps and rill oil pump hole	Cinc.
36.	Spotface and ream oil pump hole	Cinc.
37.	Drive two studs and reassemble bearing cap	Bench
38.	Semi-finish ream rocker shaft bearing	Natco
39.	Finish ream rocker shaft bearing	Bench
Group "F," Oper. No. 40 to 44 Incl., 3 Men		
40.	Drill and tap front and rear end	Baush
41.	Hand tap	Bench
42.	Finish mill rear end	Cinc.
43.	Bevel bore barrels	Cinc.
44.	Finish ream barrels	Natco
Group "G," Oper. No. 45 to 47 Incl., 3 Men		
45.	Rough lap cylinder barrels	Moline
46.	Finish lap cylinder barrels	Moline
47.	Oil test	Fixture
	Wash	
	Inspect	
	Finish stock	

work to be rolled into the fixture. Of course, the operation is faster than our description of it.

Cylinders are rough-and-finish-bored on the battery of two, six-spindle inclined Moline Hole Hogs in Fig. 7. The tables are directly in line with the wheeled carriage in Fig. 6. These machines (see description in *Automotive Industries*, Oct. 15, 1932) have a number of features well worth noting. In the first place, this is probably one of the first production boring machines with adjustable centers, varied by spacers, and with the requisite strength and rigidity for utilizing high-speed cemented-carbide tooling. The machine at the left for rough-boring employs inserted stellite blades; the finish-boring machine at the right is equipped with two Carboloy fly cutters per spindle.

Due to the use of large diameter, preloaded bearing spindles, it is possible to bore accurately within 0.001 in. without the use of top or bottom guide bushings, thus eliminating an expensive fixture.

One of the most interesting features of this machine is the method of handling the work. As the result of the arrangement of the spindles, each block is bored in four distinct steps; in the first position, three holes of one bank are bored; in the second position, the remaining three holes of the same blank are bored. Then the block is rolled on to the turntable at the right of each machine, turned around completely so that the second bank of cylinders is presented at the left end, and proceeds as before. Two blocks may be handled at a time.

In the course of both the eight and 12 production, the blocks are water-tested in a special fixture directly after the main drilling and tapping operations. In a similar fashion, the blocks are oil-tested in special fixtures after honing.

To assure the accuracy and quality of finish of cylinder barrels, the blocks are put through five distinct operations on five different machines. Thus the bores are rough-and-finish-bored as described, then finish-reamed after being beveled. Then come two final honing operations, one rough, the other finish.

The foregoing brief high spotting along the 12-cylinder line may help one to visualize the idea of the planning and development behind the new production line. Obviously, it is quite beyond the scope of this article to cover more than a hurried trip around the machine shop. Needless to say, there is much more of interest to automotive production men, not only in the way of new equipment but also in the development of fixtures and tools.

Nevertheless, even this quick trip through the plant leaves one with a definite impression that Lycoming has achieved the objectives mentioned earlier. The details of even a few pieces of equipment show without further argument that flexibility is the outstanding characteristic of the machines that have been installed. Engine designers may well envy the advantages enjoyed by Lycoming's engineering department which is free to make the most of design possibilities, knowing that the equipment may be adapted to suit needed changes without incurring any great expense.

Details of the machinery and factory routings prove beyond question that everything possible has been done to assure accuracy. Certainly there is little lacking in a production line that demands four boring machines for finishing main bearings, or five operations in the preparation and finish of cylinder bores.

The wonder of it is that this organization with its exacting standards of manufacture should be able to produce so economically.

# LET'S STAND PAT ON PRICES

**By holding car prices steady NOW as a prelude to lifting them to profitable levels, the industry can be a leader in stemming the forces of deflation**

By NORMAN G. SHIDLE

**H**AVE automobile prices finally reached bottom?

Nobody knows, but most thinking people hope so. Stabilization of motor car prices is needed as an aid to general business progress.

There are some, radicals perhaps, who even believe that an upward movement in automobile prices might have social and economic consequences of immeasurable value to the country; that such higher prices could benefit even the consumers who would have to pay a few more dollars for the cars they purchased.

"The greatest dollar for dollar value ever offered by the industry" has not come entirely from increased efficiencies. It has come largely from drastic reductions in prices paid for parts and factory equipment. Every vehicle manufacturer, incidentally, buys in large quantities from sources outside his own plant, however much the impression may be that he builds a complete car under one roof.

These astoundingly low prices have come partly from improved production methods, to be sure, but parts men themselves will tell you that they have come partly from drastically reduced wage scales as well.

"Sometimes we've wondered lately," one said in confidence the other day, "whether there is any bottom to the labor market."

A few more dollars collected per automobile, if those dollars were transmitted to the parts makers and by the parts makers to their workers, might return themselves manifold both to the automobile industry and its customers. And people in general are getting to understand this fact in a confused, subconscious sort of way. "At a new low price" may eventually come

to be regarded as a sign of general destruction instead of as a chance for individual gain.

Prices can't be stabilized or increased because of competition, say many in the industry; and add that an agreement with competitors is impossible because it is illegal. All of which is largely true. Nevertheless, continued futile price competition

between rival manufacturers can only bring disaster to all. Fifty dollars cut from the list of a low priced car is a big cut as prices stand today. Yet it means little if anything in increasing the total number of automobiles which that manufacturer will sell as compared to his competitors. One has only to think a moment of the wide variable in actual car price caused by jockeying of used car allowances to see how small a factor in merchandising a few dollars in price *really* constitutes. When one realizes, also, that the unpaid balance is spread over at least 12 and frequently 18 months, the actual practical selling importance is seen to be even less.

Add to all this the fact that no manufacturer today can hold a price advantage for himself long enough to capitalize on it, and it becomes apparent that the whole

price - war activity merely results in all manufacturers finding themselves two weeks after a price cut in exactly the same competitive position they were before—and all roosting together on a new level of unprofitableness.

Yet that same \$50—or \$150—which counts so little in determining the final volume of cars sold, means terrific effort to reduce the price of individual parts, further chiseling of already low wage rates and further intensification of every anti-social force which

**"A few more dollars collected per automobile, if those dollars were transmitted to the parts makers and by the parts makers to their workers, might return themselves manifold to the automobile industry and its customers.**

**"No manufacturer today can hold a price advantage for himself long enough to capitalize it, and it becomes apparent that the whole price-war activity merely results in all manufacturers finding themselves two weeks after a price cut in exactly the same competitive position they were before—and all roosting on a new level of unprofitableness."**

parts purveyors must unwillingly let loose in the effort to reduce.

And the manufacturing of motor vehicles is the world's largest manufacturing industry!

The fault doesn't lie with any individual or any group of manufacturers. Individually, practically every executive in the automotive industry understands and realizes the full implications of every downward price move he has made. In most instances, moreover, he has been sincerely sorry; yet he has seen no way out.

Perhaps there isn't any way. Certainly this comment is not meant as a criticism of the courageous, harried, human men who operate a large proportion of our automobile plants.

It is inspired, though, by a clear vision of the stalemate which finally is certain to be reached by further journeying down the present paths. Ever widening and ever louder rumblings and outbreaks of labor trouble of one kind or another throughout the Middle West begin to formulate an unpleasant suspicion that things may already have gone too far for the good of everybody.

Labor and industrial relations is a hush-hush topic

in the automotive industry today. Some constructive thinking is being done and some constructive action is being taken in an effort to better conditions. But the rumblings will not down.

Prosperity has always been the automotive industry's greatest protector against labor trouble; high wages its bulwark against union organization.

Neither of these things can be hoped for until the price received for the vehicle is stabilized or increased. Only through that means can there be more to distribute throughout the industry and among the hard-pressed dealers whose margins have decreased with the prices.

With present total volume and present total prices, reasonable increases would not hold down total volume to any appreciable extent. There is an economic theory which says that "the lower the price the wider the market." Up to a certain point that is true, practical economics. Past that point and under given conditions it isn't. The automotive industry is past that point; and it is operating under the given conditions which render the theory untrue.

Stabilization of automobile prices is essential to economic recovery of large areas of this country.

## Production Testing Routine Developed to Maintain Efficiency of New Ridoline Metal Cleaning System

AFTER a long period of service to the automotive industry in the field of chemical cleaners for sheet metal, the American Chemical Paint Co., Ambler, Pa., has announced its entry into the specialized field of alkali cleaners for the gamut of metal cleaning in the automotive plant.

This step is taken coincident with the introduction of the A.C.P. Alkaline Cleaning System using Ridoline, a specially prepared alkali. The new system brings in some novel ideas which are said to assure better cleaning at less cost.

Alkaline solutions that will satisfactorily remove oil, grease and extraneous matter from metal surfaces, contain at least two ingredients. First, a properly inhibited and buffered alkali, used to saponify fatty acids, to reduce surface tension, to provide the necessary electrolytic conductivity and to precipitate dissolved salts in the water. Second, an emulsifying material used to emulsify those oils that are not saponifiable, to loosen extraneous materials and to carry these and the oils in suspension, so they will be rinsed freely from the surface.

When work is cleaned in a bath, these two essential ingredients are used up in two ways, first, the work, coming out of the bath, carries some of the bath with it. This amount is known as "Dragout." The loss by "Dragout" reduces the amount of both ingredients but does not change the bath's composition. Second, the oil and some of the extraneous materials on the work are attacked by the alkalies. The alkalinity of the bath is reduced. Soaps are formed. In this case, the composition of the bath is changed. The ratio of alkali to emulsifier is altered.

Since satisfactory cleaning can be obtained only when suitable ingredients are used and when the necessary amount of each is present in the cleaning

bath, it is evident that some means must be provided to determine these, and some method must be used to calculate the amount of each ingredient that must be added to the bath to accurately replace losses.

The materials used in the A.C.P. Alkaline Cleaning System, instead of being all-inclusive, *i. e.*, instead of being alkali and soap, which have the disadvantage of building the soap content in the bath to an excessive amount, are separated. There are a number of grades of Ridoline, all of which are properly buffered and properly inhibited for the kind of metal and for the character of cleaning that is required.

Uniform cleaning can only be accomplished if the composition of the bath be kept uniform, and so that this may be accomplished, the A.C.P. Chemical Test Set No. 2 is prepared, with which the solution is analyzed for alkalinity and emulsification, and the proper amount of each of these ingredients is added to the bath from time to time, based on the analysis, so that its chemical composition is kept constant. It is an important feature that the test for emulsification considers any change in the emulsifying characteristics of the bath brought about by the formation of soaps during the chemical reaction. The operation of the Test Set is extremely simple. Charts and tables are prepared so the information obtained from the analysis can be converted simply and accurately into the pounds of alkali necessary to restore the bath to its predetermined concentration, and the fluid ounces of emulsifier necessary to restore and maintain the emulsifying characteristics.

In making up a fresh bath, the amount of alkali recommended for any particular cleaning job is added to the water, and the prescribed quantity of Emulsifier also is added. The cleaning solution is operated in the customary way.



## PRODUCTION LINES

### Laminated Synthetic Products

Continental-Diamond Fibre has done a mighty fine job in presenting engineering tables and data concerning the gamut of applications of Dilecto, their laminated synthetic product. While designed for the engineer and purchasing agent, its section on machining is bound to appeal to the factory executive as well.

### Gas Welding Helped

Much of the credit for the exceptional elapsed time record made by the Cummins transcontinental bus, on which we went as observer, goes to gas-welding and a darn good gas welder. For, in Lordsburg, N. M., we lost six hours and would have lost many more if it weren't for the local knight of the torch. He healed the shattered ends of an axle shaft so well that it held for more than 250 miles of tough mountain going. Incidentally, he told us that he has similar jobs every week from the bus lines that ply thereabouts. Can it be that factory engineers have been kept in the dark?

### Material Handling

"En Masse" conveying is a booklet describing a novel conveyor system invented in England for handling bulk materials such as grain, coal, chemicals, cement, lime and ore concentrates. Materials are carried in enclosed casings horizontally, up inclines, vertically and around obstructions in a compact, quiescent flow that prevents breakage, degradation and dust. U. S. distributors, Stephens-Adamson Mfg. Co., Aurora, Ill. A copy is yours for the asking.

*Automotive Industries*

### Metal Cutting Data

An epoch-making project in the field of metal cutting has been undertaken by the special committee on metal cutting of the A.S.M.E. Their object is to collect all available data, fill in the gaps, iron out inconsistencies in published data, and finally bring out a series of handbooks. These will make available practical information concerning speeds, feeds, tool forms, in cutting each kind and grade of metal with each kind of commonly used cutting tool. Drilling, milling, planing, etc., will be treated separately. The committee is eager to consider practical suggestions from everyone in the position to contribute pertinent advice.

### Fond Memories

Memories of our cub days were revived when we went through the Kleiber truck plant in San Francisco on our recent visit to the Coast. Here was a real old-time blacksmith shop with good old timers sweating at the blazing forges. Maybe it's just sentiment, but we haven't seen husky spring clips bent over an anvil since our dad did the same kind of a job many years ago.

### Glass Electrodes

No. 188 of the *Technical News Bulletin* tells of the development of a metal-connected glass electrode in which the metallic coating was applied directly to a thick-walled tube. Glass electrodes are of recent origin and have proved valuable for measuring the degree of acidity of solutions. One practical application is in checking pH values of electroplating baths in research as well as production.

### The Low-down

Although the Technocrats are temporarily dispossessed, those interested in learning something about Technocracy, its objectives, if any, as well as its leaders, may profit by reading "What is Technocracy?" It is written by Allen Raymon, staff writer on the *Herald Tribune* (N. Y.). Publishers, the Whittlesey House, a division of McGraw-Hill. Price, \$1.50, very nominal. The book also devotes space to the criticisms of some well-known economists and writers.

### Enamel Properties

A recent investigation at the Bureau of Standards has revealed an interesting fact concerning mechanical failure of enamel coatings. Despite earlier conclusions, it is found that variations in the modulus of elasticity may be overlooked as an important factor in resistance to mechanical failure.

### Rubber Belting

B. F. Goodrich announces the perfecting of a new rubber belting which successfully resists the action of chemicals and oils. Patent covering the new belting was issued early in November. The company is now ready to begin producing it for all types of service from automobile fan belts to belting for heavy machinery.

### Noble Tires

This is as good a place as any to doff our bonnet to the folks who made the General tires that shod the Cummins bus across the continent. Those Generals took terrific pounding. Rolling at 65 on straightaways—40 to 50 around turns—yet they were in perfect shape at the end of the 3300-mile journey.—J.G.



# BOOK REVIEWS

## Automotive Electricity

*Automotive Electricity*, by Earl L. Consoliver, M. E., and Beverly B. Burling, B. S., E. E. Published by McGraw-Hill Book Co., New York, N. Y.

**T**HIS is a second edition of the book of similar title for which Professor Consoliver signed as the author. The book is the outcome of a course of instruction conducted by the authors during the past sixteen years in training automotive electricians and battery service men.

The new edition has been brought up to date and new information has been added on the subjects of spark plugs, headlight illumination, motor coach wiring, motor-coach and aircraft generator regulation, airplane generators, airplane ignition and motorboat starter-generator ignition systems.

Instruction sheets for demonstration in class or for jobs to be performed by the pupil are included. There are questions at the end of each section.

## Selected Welded Designs

*Ausgewählte Schweißkonstruktionen, Band 4, Fahrzeugbau* (Selected Welded Designs, Vol. 4, Vehicle Construction.) Compiled by Dipl.-Ing. Ernst Kallisch.

**T**HIS book, which is of loose-leaf form, contains a considerable number of examples of the application of welding in the manufacture of vehicles and airplanes. The material was gathered by the Committee on Welding of the German Society of Engineers and consists largely of photographic illustrations and some line drawing of parts and assemblies that have been fabricated with the aid of modern welding processes, together with brief explanations. These explanations are printed in both German and English.

## Simple Aerodynamics and the Airplane

*Simple Aerodynamics and the Airplane*, by C. C. Carter. Published by Ronald Press, New York.

**T**HIS is a fourth edition of a book originally written by Charles N. Monteith, Air Corps, U. S. Army. Col. Carter, who is responsible for the revision, is professor of natural and experimental philosophy at the U. S. Military Academy, and the work is intended as a text for students in aerodynamics. The character and scope of the book have not been materially changed from previous editions, but much of the text has been re-written and much new matter included. The entire work was reviewed with the object of giving a logical, thoroughly coordinated, up-to-date and "teachable" presentation. Very little mathematics is used and the book is well illustrated.

March 11, 1933

## Mufflers for Automobiles

*Schalldämpfer für Automobilmotoren* by Dr.-Eng. Alfred Kauffmann and Dr.-Eng. Ulrich Schmidt. Published by M. Krayn, Berlin.

**T**HIS work represents the results of a research on the subject of exhaust noises and their muffling or damping. It is in two parts, the first part, entitled "The Exhaust Noise," being by Dr. Schmidt, and the second part, "Noise Muffling," by Dr. Kauffmann. Recent developments in the matter of noise measurement and noise analysis were made use of in the investigation. In the first part, for instance, diagrams are given showing the relation between the "noise-energy amplitude and the speed and load of the engine, and of the variation of the energy-amplitude of individual tones of the exhaust noise with the frequency. There, also, the logarithmic relation between the sound-energy amplitude and the effect on the ear is explained.

Experiment on exhaust mufflers covered both the expansion-chamber type and the so-called straight-through type. Mufflers were tested with respect to both their noise-muffling or damping efficiency and the back pressure produced by them at different engine speeds. A method for comparing the over-all efficiency of mufflers is developed. The coefficient of resistance to flow (back pressure) is defined as  $W = 100 h/Q^2$ , where  $h$  is the back pressure per liter of piston displacement in millimeters of mercury column, and  $Q$  is the volume of gas passing through the muffler per second. The coefficient of merit of the muffler then is a function of the mean intensity of the noise in phones over the whole speed range of the engine and of the coefficient of resistance to back flow. Those engaged in the practical development of mufflers will no doubt find many helpful suggestions in the book.

## Machinability of Cast Iron and Steel

*Zerspanbarkeitsuntersuchungen mit Spiralbohrern*. By Professor A. Walichs, Dipl.-Ing. H. Beutel and Dipl.-Ing. W. Mendelson. Published by V. D. I. Verlag, Berlin, NW 7, Germany.

**T**HIS is a report on an investigation of the machinability of cast iron and steel by means of twist drills. The report contains three sections. In the first the effect of drill characteristics on the cutting pressure and the life of the cutting edge is dealt with. In the second section the machinability of various grades of cast iron and of cast steel is discussed, and in the third, equations are developed for cutting pressure and the cutting speed, which equations permit the determination of the feed which will give the minimum time for a given boring job with permissible pressure on the drill.

Automotive Industries

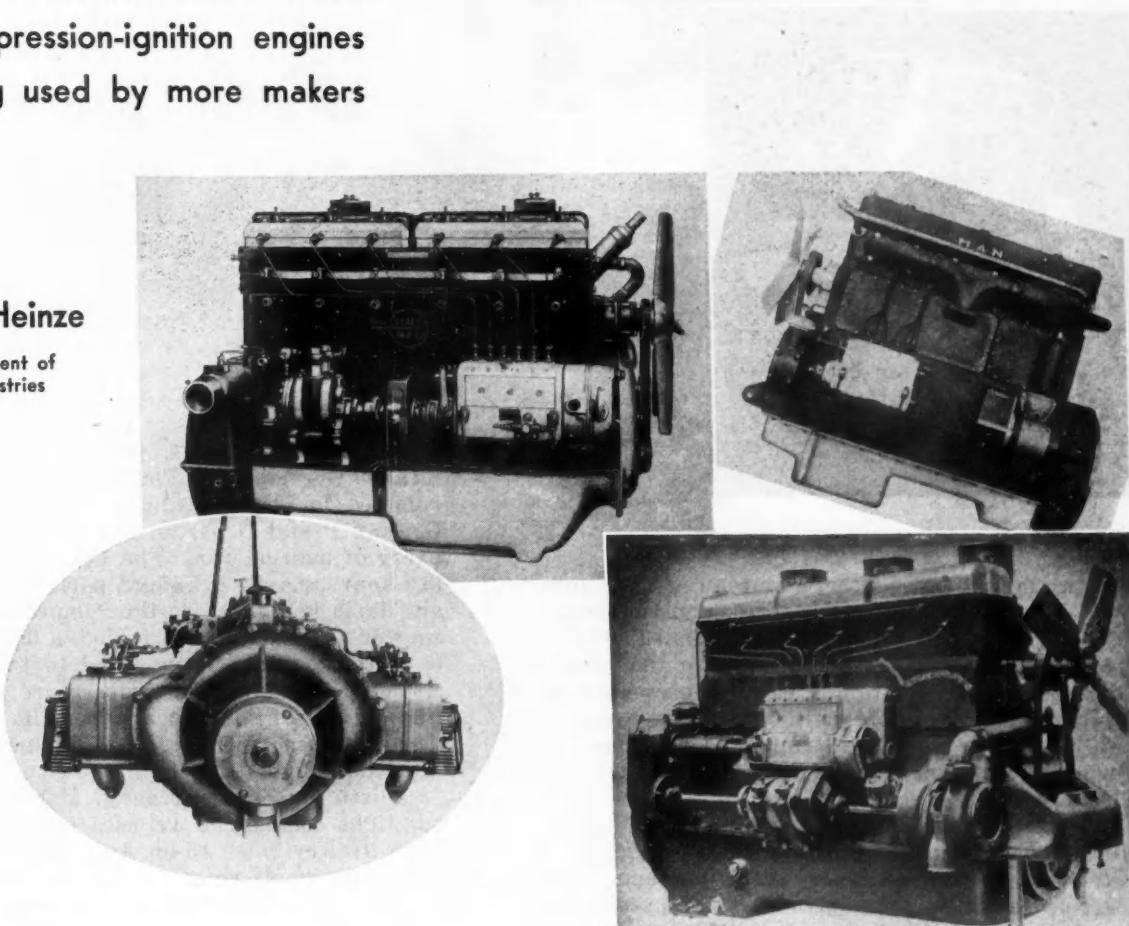
# 35 Diesel Truck Models at Berlin Show

Designers turn attention to smaller sizes of compression-ignition engines — air cooling used by more makers

By

Edwin P. A. Heinze

Berlin Correspondent of  
Automotive Industries



A LARGE variety of automotive type Diesel engines, of which 35 models were offered by ten different makers; increased use of air-cooling for the engines of light commercial cars, numerous tractor-semi-trailer combinations and new developments in producer gas outfits, heavy-fuel carburetors and railcars on automotive lines featured the motor transport section of the Berlin automobile show, which has just come to an end.

Diesel engines have been developed particularly in the direction of smaller units. This movement was started some years ago when the Junkers Motor Manufacturing Company marketed its two-cylinder, two-stroke, double-piston type of engine of 45 hp. and was followed by Daimler-Benz early last year with a four-cylinder, four-stroke precombustion-chamber type of engine of 55 hp. Both of these engines are said to have met a satisfactory demand, and this naturally turned the attention of other manufacturers in that direction.

The Hanomag company has introduced a four-cylinder precombustion-chamber-type of engine of 48 hp.

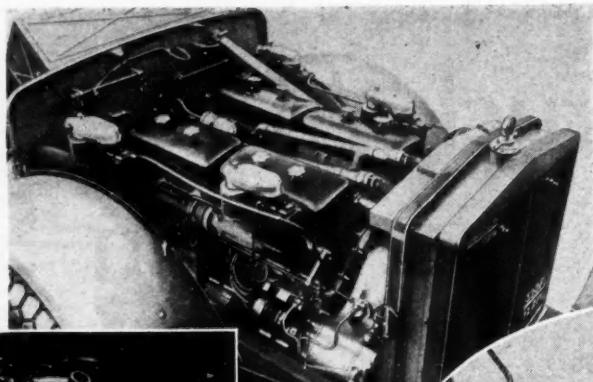
(Upper Left)—Six-cylinder Buessing-NAG Diesel engine of 105-110 hp. at 1300-1400 r.p.m. Note that accessories drive gear is located at center of engine

(Upper Right)—M. A. N. 100 hp. Diesel engine with welded steel frame

(Lower Left)—Krupp 50 hp. four-cylinder air-cooled Diesel engine. The blower has two volutes, each feeding to the jackets of one pair of cylinders

(Lower Right)—Daimler-Benz six-cylinder Diesel engine, pump side. Note that accessories are driven from rear end of engine

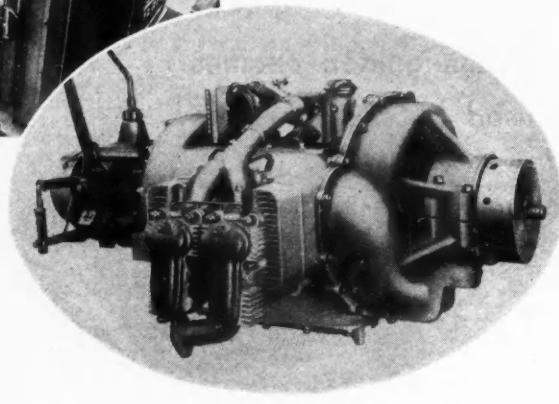
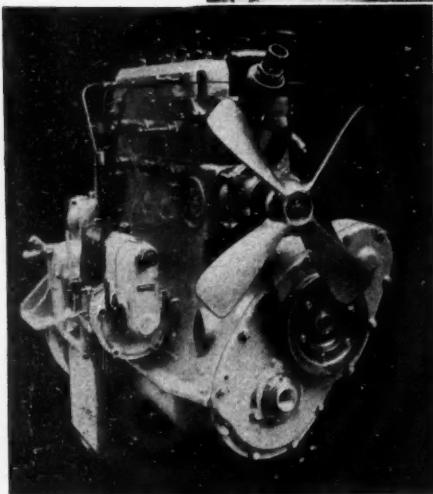
at 1300 r.p.m., and the Buessing-NAG company enlarged its line of Diesels by adding a three-cylinder precombustion-chamber type of 40 hp. The Kaemper Motor Manufacturing Company, which has long specialized on Diesel engines, entered the automotive field with a line of engines of the precombustion-chamber type, one four-cylinder model developing 43 hp. at



(Top)—The Buessing-NAG dual engine of 320 hp. The engine has twelve cylinders and four carburetors are used

(Lower Left)—Buessing-NAG three-cylinder Diesel truck engine. A 120-deg. crankshaft gives uniform spacing of power impulses and assures a fair degree of mechanical balance

(Oval)—Krupp 60 hp. air-cooled gasoline truck engine



1500 r.p.m. Likewise the Motorenwerke Mannheim (MWM) extended its line of precombustion-chamber engines by bringing out a four cylinder of 62 hp. Precombustion-chamber engines are in the majority, while the direct-injection type is represented principally by MAN, and Junkers, which latter engine is now also being built by Krupp under license. The new unconventional Michel engine also belongs to this type.

Among the most interesting new engines is one of 110 hp. by Henschel, on the Lanova principle (see *Automotive Industries* of Jan. 23, 1932, and a 50-hp. air-cooled engine by Krupp. In the Henschel engine the compression chamber is in two parts in tandem which can be cut off from each other by means of a valve to increase the compression ratio for starting. The air-cooled Krupp Diesel engine is an adaptation of that company's air-cooled gasoline commercial-vehicle engine which has two horizontally opposed banks of cylinders. A more robust crankshaft is used in the Diesel, and the cylinder heads of the gasoline engine are replaced by others with precombustion chambers. The carburetor engine develops 60 hp. and the Diesel 50 hp. A Compur injection pump is employed.

Another engine of particular interest from the production standpoint is an M.A.N. of 100 hp., with a welded steel frame. Outwardly it can hardly be distinguished from an engine with cast frame, but it is said to be about 15 per cent lighter and also cheaper to produce. In general design it is similar to other M.A.N. Diesel engines for road transport, of which there are now five models, all having six cylinders. The smallest of these, with a piston displacement of 400 cu. in., develops 70 hp.

The development of blowers and experience gained with air cooling has induced a number of German manufacturers to introduce one- and two-ton trucks

with air-cooled engines. The pioneer in this development in Germany was Phaenomen of Zittau, which has supplied hundreds of light air-cooled trucks to the German Postal Department for the collection and delivery of mail matter. The Phaenomen engine, which has four upright cylinders partly surrounded by an air duct, has been further improved recently. To shorten the warming-up period, a flap valve controlled by a thermostat is now fitted to the blower casing. As long as the engine temperature is below normal, this valve is held open and permits most of the air moved by the flywheel fan to escape without passing over the cylinders.

Goliath and, more recently, Magirus, have brought out light commercial vehicles of 1-ton rating which carry two cylinder 15-hp. two-stroke engines of only 36 cu. in. displacement under the frame. Transmission of the power to the driving axles is conventional.

The Hanomag company has a 3½-ton truck with a four-cylinder 48-hp. Diesel engine mounted horizontally under the frame, the cylinder head being accessible from the left side. By these means a large loading space can be obtained with a short wheelbase.

While most attention has been devoted to Diesel engines, the carburetor engine has not been neglected. It may be recalled that at the show two years ago the Henschel company created considerable interest in a double-six cylinder engine of 250 hp. output, and this same engine was shown again this year. Now Buessing-N.A.G. has gone Henschel one better, however, and brought out a 320 hp. engine intended for high-speed interurban buses. It consists virtually of two six-cylinder engines mounted side by side on the same crankcase. The two engines are, however, independent of each other, and either of them may at any time be shut down without affecting the operation of the other, this being made possible by the use of free-wheeling units. This dual engine was developed for use on a Buessing-NAG six-wheel chassis, in which the two rear axles are independently driven by the two engines. One of these chassis was on exhibition at the show. There are, of course, two entirely separate transmission lines comprising two five-speed

gearboxes which are operated synchronously by means of a compressed-air control system. The idea is to make a high average speed possible by using both engines when starting under load and on fairly steep up grades. A maximum speed of 65 m.p.h. is claimed for the bus. The same company has also brought out an eight cylinder engine for similar work, of 155 hp., but in this case the two banks of cylinders are set on a common crankcase at an angle of 90 deg.

Interest in producer gas plants seems to be increasing in Germany, and besides Humboldt-Deutz (which was not represented at the show) several other companies have developed such plants. The Imbert company showed a road tractor fitted with it and also a Henschel truck, which was used for demonstration purposes.

There has been also a revival of interest in carburetors for heavy fuels, of which several makes are offered for replacement purposes at from \$50 to \$100 per carburetor. Among these the Columbus is claimed to work on practically all kinds of heavy oil, while the Werner operates best on tractor fuel.

A relatively new development in Germany is the offering in considerable numbers of tractor and semi-trailer combinations. Practically all of the prominent truck manufacturers now offer combinations of this type with Diesel engines and with 4 to 12 tons load capacity. Some of the outfits intended for long-haul service are provided with a sleeping berth back of the driver's cab. Numerous different designs of couplings for these semi-trailers, and also for four-wheel trailers are being offered by specialists. Quite a number of four- and six-wheel trailers are being offered which have a frame composed of a single central tube, and so-called swinging axles and independently sprung wheels. These are claimed to be lighter in weight and safer at high road speeds, and most of them are provided with knuckle steering instead of fifth-wheel steering.

A new field being cultivated by the automotive industry is that of light rail cars. One such car has been developed by the Adam Opel Company in cooperation with the Uerdingen Car Works, a well-known car and automobile body builder specializing in all-steel and light-metal bodies. The car has four wheels of a special type with annular rubber inserts between the rim and the hub. The two axles are rigidly mounted on a rectangular frame, upon which the light body is supported through four inverted semi-elliptic springs. An Opel truck engine at 64 hp., with integral four-speed transmission, is mounted on the frame and drives to one of the axles. A special reverse gear is provided which makes it possible to run the car in either direction. Control stands are provided at both ends, and the driver's seat at the end that is not in

use can be made available for passenger-carrying purposes by reversing it, the driver's cabs being open to the interior of the car. A free-wheeling unit is provided to facilitate gear-shifting. Braking is assisted by a Bosch-Dewandre power unit. The whole car weighs only about 5 tons.

The Krupp company also has developed a light 30-passenger railcar. It has two trucks, the four wheels of each of which are provided with solid rubber tires. The 60-hp., four-cylinder air-cooled Krupp carburetor-type engine is suspended underneath the car and drives the four wheels of one of the trucks through an automobile-type transmission. In addition to a reversing gear making it possible to drive the car in either direction, there is a four-speed Aphon gearbox with hydraulic control from either end of the car. A hand brake and a foot brake are provided, each operating on the four wheels at one end of the car.

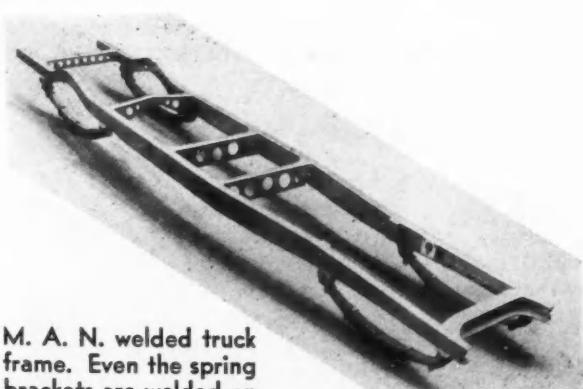
A third and somewhat heavier rail car was shown by Henschel and was entirely different from the railcar exhibited by the same company two years ago. The feature of the new car is an hydraulic torque converter known as the Hydroflex, which is said to be essentially a combination of the Foettinger transformer and Foettinger fluid clutch. This device is said to give only a limited range of torque ratios and cars are to be provided with transmissions specially designed for the maximum grade on the line on which they are to operate.

## Survey of European Diesel Exports

(Continued from page 302)

The number of inquiries from manufacturers and exporters interested in learning the extent to which Diesel-engined commercial vehicles are being produced, used in regular commercial operation, or undergoing tests in foreign countries, prompted the writer to obtain from Commercial Attachés, Trade Commissioners and Consular Officers all of the readily available data as to what the motor transportation business is doing with the Diesel proposition in 20 or 30 representative countries, exclusive of the United States and Canada, without any attempt to prove or disprove the practicability of the Diesel engine for automotive purposes. It must be said, however, that there are many concrete evidences of more than casual world interest in this form of power. The material gathered simply presents the situation as reported from foreign countries for the consideration of the American industry, since at least six United States truck makers are now sufficiently interested in the subject to build Diesel-engined trucks as part of their regular lines.

In the present article, space will not permit going into detail as regards developments in individual foreign countries, but considerable information has been brought together bearing on production and types of Diesel vehicles offered in the principal manufacturing countries, and indicating sidelights of actual use or experimentation in a number of non-producing countries. This is available to American firms if there is sufficient demand to justify its printing or duplication otherwise. American firms or individuals interested in receiving the detailed information collected should address the writer at the Bureau of Foreign and Domestic Commerce, Washington, D. C.



M. A. N. welded truck frame. Even the spring brackets are welded on

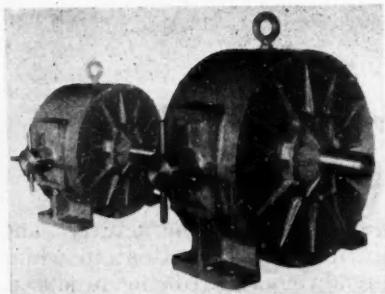
# NEW DEVELOPMENTS

## Automotive Parts, Accessories and Production Tools

### Rotary Radial Piston Type Pumps

The Northern Pump Co., Minneapolis, Minn., announces a complete new line of hydraulic pumps and motors of the rotary radial piston type. A complete choice of pumps is available in sizes from one gallon per minute to 200 gallons per minute and pressures of 4000 lb. per square inch, pumping oil for hydraulic systems.

The volume of discharge can be changed to deliver any amount from 0 to the maximum capacity of the pump and the discharge can be re-



versed without stopping the pump or changing the speed of rotation.

The series 5000 pumps are available with a complete line of automatic controls and semi-automatic valve mechanisms.

All of the pumps are fitted with nitrallloy, which will permanently resist wear. All pumps incorporate a balanced pressure design whereby hydraulic forces are balanced to prevent heavy bearing loads at high pressures.

### G. E. Magnetic Analyzer

Magnetic impurities in asbestos, mica, glass, sands, and other similar materials are said to be easily detected and their extent measured by means of a new magnetic device announced by the General Electric Co., Schenectady, N. Y. The equipment was first developed for use in the General Electric shops for determining the amount of magnetic oxide of iron present in asbestos, but it is expected to have wider application in industry.

In its application to analyzing asbestos the device tests specimens containing up to 5 per cent of magnetic ferric oxide impurities; operates on 110-volt, 60-cycle circuits, and can be used by workmen unskilled in electrical measurements.

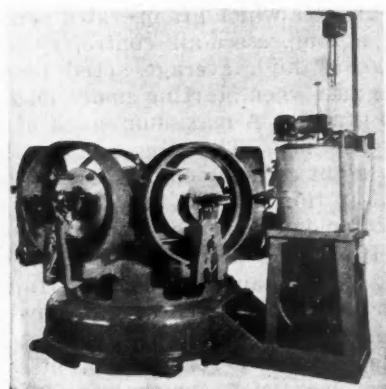
### MCE Automatic Centrifugal Babbetting Machine

A new multiple-head automatic centrifugal babbetting machine has been placed on the market by the Manufacturers' Consulting Engineers, Syracuse, N. Y. It is a continuous machine, the operator simply unloading babbitted rods and loading unbabbitted rods.

As each head comes to the operator, the fixture is open so that he may remove the babbitted rod and load a tinned unbabbitted rod. The spindle of that head starts to rotate and as it passes the pouring spout of the babbitt crucible, a measured quantity of babbitt is poured into the rod. The spindle, fixture and piece continue to rotate until the babbitt has solidified. At this time, the spindle stops rotating and the fixture is indexed to a convenient loading and unloading position, the fixture opens and the babbitted rod is removed and replaced with an unbabbitted piece. This cycle is then repeated.

If for any reason the operator fails to load a fixture, as that fixture passes the pouring spout there will be no babbitt poured. If for any reason whatsoever the operator does not wish to pour babbitt into a piece on any particular head, he may trip a mechanism as it passes him so that no babbitt will be poured as that particular head passes the pouring spout.

The babbitt is supplied from an electrically heated babbitt crucible, the temperature of which is controlled by a thermostat. The level of the babbitt is maintained in the crucible by an automatic pig feeder, so that as babbitt is used from the crucible fresh babbitt is added. To agitate the babbitt while it is in a molten condition, a motor driven agitator is provided, the spindle of which is retractible. When the machine is shut down and the babbitt is allowed to cool, the agitator shaft is withdrawn from the babbitt.

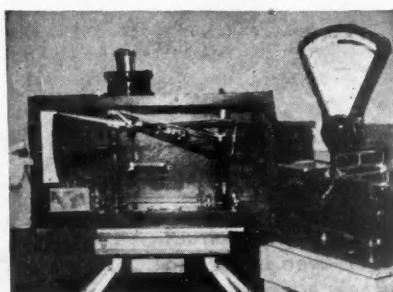


This machine is motor driven, the motor being located directly under the babbitt crucible, and all electric control switches conveniently located. Power is transmitted from the motor through a spiral bevel pinion and gear to a central gear sleeve which rotates about the center post of the machine. From this gear sleeve, power is transmitted through a gear train to the table on which the heads are mounted.

### Toledo Dynamic Weigher

Toledo Precision Devices, Inc., Toledo, Ohio, has developed the new Toledo Dynamic Weigher which combines the speed of an automatic scale with the precision of a laboratory balance. It is said to be highly efficient in classifying pistons, bearings, valves, cams and other reciprocating and rotating parts and rejects over-weight or under-weight parts.

Operating on a new principle, this scale determines the mass of an article or commodity by measuring inertia while the scale is in motion. Speed of weighing is obtained because it is unnecessary to wait for the scale indicator to settle to rest. Accuracy is obtained by the extreme sensitivity of the device; so that masses of several pounds weight can be measured to an accuracy of a few grains. Models can be furnished with total capacities ranging from 1 gram reading to milligrams, up to 10 kilograms reading to grams. Indication is automatic, thus facilitating accurate reading of weights. If desired, the weigher can be furnished with the "electric eye" to increase the speed of the classifying operation and to make the machining operation more automatic.



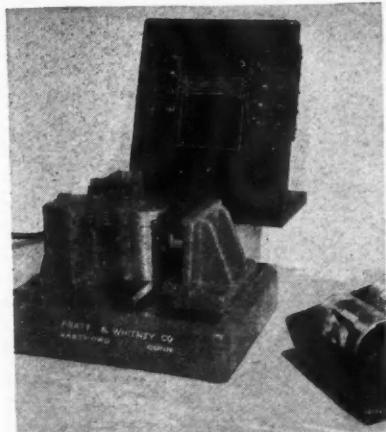
## Catalin Cast Synthetic Resin Products

Sparkling, lustrous effects in fittings and ornaments for automobiles and aircraft are said to be achieved by a new process of producing cast synthetic resin by the American Catalin Corp., New York. Catalin is produced in rods, sheets, tubes, or special castings. It requires no seasoning and is said to be impervious to the weathering and exposure incident to automotive service. It is furnished in more than 75 standard colors, plain, mottled, opaque, translucent, or transparent.

Catalin can be worked in the same fashion as wood or metal. It can be turned, filed, sawed, drilled, tapped, embossed, or engraved. It polishes and finishes to a permanent high lustre.

## New Pratt & Whitney Electriclimit Gage

The gage division of the Pratt & Whitney Company, Hartford, Conn., has developed an interesting electric gage for checking a number of diameters simultaneously. As shown in



the illustration, the gage is arranged to check nine diameters on piston. Five of these are outside diameters; four are groove diameters. Checking is done by means of electric contacts arranged to engage the desired surfaces as the piston slides through. When the part is within the desired limits, no lights appear on the indicating board. If any dimension is oversize the corresponding green light flashes on, or if it is undersize the red light appears as the piston is moved through the contacts.

After several weeks of continuous performance on the inspection bench it has been found that this gage has cut inspection time approximately 65 per cent. Eight hundred sixty-four pistons per hour now are gaged as against 288 per hour previously, a ratio of 3 to 1. Moreover, there is said to be an increase in uniformity

and quality of inspection. A less skilled inspector is used on the job than formerly. This is because the new gage eliminates the human element factor entirely. The signals on the panel board either light or do not, and the work is graded accordingly.

Applications of this type of electric gage are widespread. It can be applied to any piece where one or a multiple number of dimensions are to be gaged, thus lumping several gaging operations in the one, with consequent savings. The general appearance of the gage will change for different jobs, but the fundamental principles remain the same. It is said to be possible with this type of gage to hold limits closer than usual, and yet obtain entirely satisfactory gaging at high speed.

## New Photoelectric Controller

New in the field of light sensitive control is the "Photo-Troller" recently announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. It is a rugged industrial device which can be actuated by a phototube or by delicate contacts carrying only a few microamperes. Due to its flexibility and low cost, the Photo-Troller is specially adapted to applications, such as counting, limit switch, door opening, automatic weighing, etc.

The phototube, or sensitive contact, operates a sturdy grid glow tube directly which in turn closes a contactor capable of initiating any desired operation. Thus, delicate intermediate relays are eliminated and greater reliability is obtained than in any device previously offered. The Photo-Troller is assembled in a sheet-metal cabinet with convenient door and knockouts. Units are available for any commercial voltage or frequency except D.C. The device contains a complete power supply for all auxiliaries including the light source. Various light sources are available to operate at distances up to 22 ft. from the phototube.

## Bacharach Manometers

Bacharach Industrial Instrument Co., Pittsburgh, Pa., manufactures direct-reading manometers in five standard types and 20 stock sizes. These instruments may be used to indicate pressure, suction, or pressure difference up to 160 in. of water, 80 in. of mercury, or 40 lb. per sq. in. The Type MF has a high-test cast iron base, a V-shaped scale frame, removable glass front and high-pressure glass tube. If the scale graduations are in inches of water the liquid actually used in the manometer is a red-colored oil. The latter is said to be superior to water because of its friction-free

flow and its constant capillarity. The oil has a low coefficient of thermal expansion, and under all ordinary conditions the slight change in its specific gravity with change in temperature can be neglected.

## Producto-Matic Miller

What is said to be a new approach to the handling of certain kinds of milling has been incorporated in the design of the No. 120 Producto-Matic miller which is built by the Producto Machine Co., Bridgeport, Conn. This particular design incorporates the use of a table traveling horizontally and automatically with the cutter heads traveling vertically and automatically. These two movements can be combined in any way to secure the required milling cut.

So far this new No. 120 machine has been planned with two columns and cutter heads so that two groups of parts can be set on the table generally mounted on each end. In this way these two sets of units are alternately milled, that is, the operator can be loading and unloading one group of parts on one end of the table, while the other group or set of parts is being milled.

Provision has been made on this type of machine to receive three or even four columns and cutter heads if the work should demand it.

In general the use of the cutter head traveling vertically is to bring the cutters into the exact depth of cut and to retain this position, while the table travels horizontally to finish the main portion of the cut. However, the cutters can be arranged to leave the work at any desired point and to return again, if necessary. This might be the case where two sets of keyways are milled in the same shaft. With the combined movement of the cutters traveling vertically and the table traveling horizontally, it is possible to make a cut on any desired angle or radius.

This machine is said to have been used successfully in milling keyways in rear axle shafts and propeller shafts in automobiles and armature shafts in electric motors.

This machine can be classed as a heavy-duty miller because it ordinarily weighs 9000 lb. with two columns and cutter heads. A 10 hp., 1800 r.p.m. motor is generally used.



## Sales Slow Down But Don't Stop

### Holiday Cramps Finance Company Efforts to Ease Situation for Dealers

Retail sales, although proceeding at an extremely low rate, have not halted during the bank holiday. Cash is playing but little part in any car transactions, either retail or wholesale, but the attitude of different dealers toward the acceptance of checks has varied considerably.

Some dealers are making deliveries to responsible customers and accepting checks drawn on banks considered to be sound. Others are on a strictly cash basis but where the used car is sufficient to cover the down payment, are accepting time payment contracts for the balance in many instances.

Finance companies are doing everything in their power to carry on during the emergency. Tied up by law as banking institutions, however, their operations are definitely cramped. They are reported to be handling wholesale financing for dealers by utilizing the willingness of factories to accept the credit of the finance company. By a bookkeeping transaction, in other words, the finance company makes it possible for some dealers to get cars at least in limited quantities. In many cases, the finance companies say they are handling 100 per cent of the dealer cost of the cars, trusting that the usual 10 per cent will be forthcoming as soon as conditions permit. Dealers, however, indicate that such financing is on a limited scale.

### Liberal Credits NOW!

In this situation the constructive course of procedure is for present creditors to ship merchandise to the customers who have been and continue to be in good credit, even though handicapped at the moment. By following that course distributors will enable their customers to reestablish their liquid position through the conversion of merchandise on hand and new shipments into accounts receivable and consequently into cash.

It is an emergency—it is a situation that justifies broad, liberal credit policies, even though a small percentage of the merchants throughout the United States will take advantage of existing conditions to endeavor to make settlements which are not justified.—*R. G. Dun & Co. and the Bradstreet Co.*



### MEMA Show Set for Chicago in October

Buckman Will Manage  
Exhibition Planned  
for Merchandise Mart

NEW YORK—Plans developed by the Trade Show Committee of the Motor and Equipment Manufacturers Association call for a National Automobile Maintenance Exposition, under MEMA sponsorship, to be held in

Finance companies are taking a liberal view of collections and repossession problems during this time of stress. They are inclined to be as lenient as possible in extending time for payments and in refraining from repossession in case of non-payments. This leniency is being exercised, in most cases, at least, without financial penalty to the delinquent.

Replacement parts and equipment manufacturers have carried on in general without interrupting production or shipments materially. They are working on the basis that wholesalers whose credit was good yesterday will again be good risks tomorrow.



Herbert Buckman

## New Federal Bankruptcy Law Facilitates Adjustment of Individual and Farm Debts

Only a Majority of Creditors in Number and  
Amount Now Required to Get Court Approval  
of Debt Composition of Extension Proposal

WASHINGTON, D. C.—Under the terms of the amended Bankruptcy Law which went into effect on March 3, with the signing of the bill by President Hoover, an individual may start voluntary proceedings by filing in a bankruptcy court, a petition stating that he is insolvent or not able to meet his debts as they mature and, therefore, wishes to effect a composition or obtain an extension of time in order that he can meet his obligations.

Applications for confirmation of a composition or extension proposal,

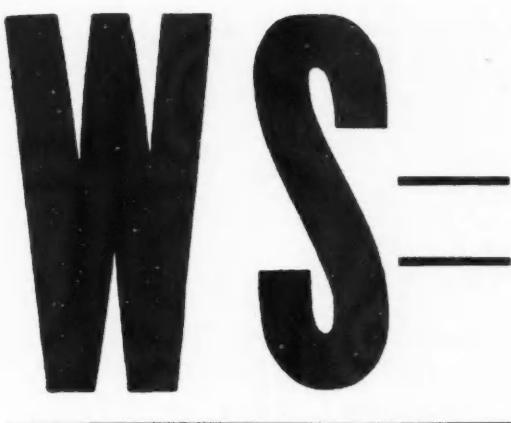
when presented to the court, must be accompanied by evidence of approval by a majority both in number and amount of creditors whose claims are unsecured, but have been allowed, and such secured creditors as would be affected by an extension proposal. In addition to that, money or security must be deposited to an amount required to pay all debts which have priority unless such priority is waived, the cost of the proceedings and, when a composition is asked for,

(Turn to page 324, please)

the Merchandise Mart, Chicago, from Oct. 23 to 28 inclusive. Herbert Buckman, manager of the Cleveland Automobile Manufacturers and Dealers Association, who managed the joint MEMA-NSPA Show held in Cleveland in 1930, has been retained to manage the show.

The MEMA plans to develop a comprehensive exposition of all products entering into the service and maintenance of motor vehicles which will be even broader in scope than the trade shows of the past. In addition to

(Turn to page 325, please)



## GM February Sales Amount to 59,614

U. S. Retail 10 Per Cent Under Last Year — Two Months' Sales Above '32

NEW YORK—February retail sales of General Motors cars and trucks amounted to 42,280 in the United States compared with 50,653 in January and 46,855 in February, 1932. The respective declines are 16 and 10 per cent.

Sales to U. S. dealers in February were four per cent under a year ago, while the decline in total sales to dealers including Canada and overseas, was five per cent.

The detailed figures follow:

Sales to U. S. Consumers			Per Cent
1933	1932		
January . . . . .	50,653	47,942	+ 6%
February . . . . .	42,280	46,855	- 10%
Total—2 Mos.			- 2%
Sales to U. S. Dealers			
January . . . . .	72,274	65,382	+ 11%
February . . . . .	50,212	52,559	- 4%
Total—2 Mos.			+ 4%
Total Sales—U. S., Canada & Overseas Shipments			
January . . . . .	82,117	74,710	+ 10%
February . . . . .	59,614	62,850	- 5%
Total—2 Mos.			+ 3%

### New Twin Wasp

HARTFORD, CONN.—A second two-row, radial air-cooled engine, said to be the most powerful aircraft engine produced in this country, has been brought out by the Pratt & Whitney Aircraft Co. It will be known as the Twin Wasp and is a larger sister to the Twin Wasp Junior. The new engine has fourteen cylinders.

### Perfect Circle Ring Priced Lower

HAGERSTOWN, IND.—The list price on the single-duty Perfect Circle piston ring had been reduced from 60 to 45 cents for sizes under 4½ in.

## Industry in Temporary Shut-Down as President Acts to End Bank Crisis

Suspension Includes Both Vehicle Plants and Parts Suppliers—Expect New Deal to Provide Remedies That Will Permit Early Resumption

DETROIT, March 7—The national banking holiday, proclaimed by the new President to provide time for the preparation of the first cards to be passed out in his "new deal," has temporarily brought automotive manufacturing operations in this area to a virtual stop. Resumption is expected at an early date but the day depends largely, of course, on the promptness with which nation's credit machinery starts to function. Reports from Washington indicate that some relief which will permit resumption on some basis, is likely within the next few days.

Both vehicle makers and their suppliers in this area, are included in the present temporary shut-down. In the case of the latter, suspension was

necessary in part because of the shutdown of the car makers but mainly because of lack of available funds due to the prolonged Michigan bank holiday for continuing business.

Criticism of bankers is rife among industrial and other automotive executives here. Because practically all automotive business is interstate, the issuance of scrip locally to meet the situation here is not looked upon as a solution unless provision is made for the transfer of funds from one banking area to another. The general attitude is that whatever remedies are applied must be national in scope to be effective so that business can function on a broad scale.

Detroit factories early this week were advising dealers to accept only cash or consummate only such deals as they are able to take care of themselves. At the same time, finance companies apparently were taking the President's proclamation as mandatory upon themselves, and are largely suspending all finance operations while the emergency continues.

### Wayne County 14 Per Cent Under January

DETROIT—Passenger car registrations in Wayne county during February totaled 2045, a decrease of only 14 per cent from January and 20 per cent from last February.

Chevrolet was first with 622, and Ford second with 418 representing substantial increases over both January, 1933 and February, 1932 totals.

Pontiac was third with 173, Dodge fourth with 133 and Plymouth fifth with 131.

Commercial registrations were 102 against 147 in January and 205 in February last year.

### Dodge Continues Up

DETROIT—Dodge dealers' retail deliveries of Dodge and Plymouth passenger cars recorded so far this year exceed sales made during the corresponding period of 1932 by 50.6 per cent.

### Dodge Adds Two-Door

DETROIT—A new two-door sedan listing at \$630 has been added to its six cylinder line of body models by Dodge Brothers. The price compares with \$660 on the Salon Brougham, formerly the lowest priced five passenger closed model in the Dodge six cylinder line.

### Graham Output Higher

DETROIT—Graham-Paige Motors Corp. has reported that shipments for February were slightly in excess of January figures with schedules for March tentatively set at 25 per cent above February.

## New Federal Bankruptcy Law Facilitates Adjustment of Individual and Farm Debts

(Continued from page 322)

the consideration to be paid to the creditors by the debtors.

In the case of involuntary proceedings the debtors' statement would take very much the same form as the petition in the voluntary procedure and must be filed as an answer before adjudication.

The court will decide on applications for compositions or extensions after a hearing at which objections may be entered. Under an extension proposal the time for payment of both secured and unsecured debts may be prolonged; priority of payments by the secured and unsecured creditors may be provided for and a supervisory control of the debtors' affairs during the period of extension by a creditor committee or other agency may be set up. Both the debtor and his creditors shall be bound by an extension proposal after confirmation, with the provision, however, that there shall be no reduction or impairment of the lien of any secured creditor by the extension or composition. Only the time and method of liquidation shall be affected.

Liquidation of the estate of the debtor may be ordered by the court in case of default on his obligations under the confirmed proposal without sufficient reason. No order of liquidation or adjudication shall be entered in any proceeding instituted under this section of the law by or against a wage earner or a farmer without the latter's consent. Secured creditors may be enjoined by the court from enforcing their claims until an extension proposal has been either confirmed or denied.

### *In the Matter of the Farmer*

To provide for the exigencies of farmers, the amended law provides that when 15 farmers within any county certify that they intend to file petitions, the bankruptcy courts may appoint one or more referees for the county, to be known as conciliation commissioners. Only residents of the county are eligible for such appointment and they must be familiar with agricultural conditions but not engaged in farm financing, supplying or farm commodity dealing.

Any farmer, within five years after the law went into effect, may file a petition asking for a composition or an extension of time and stating that he is insolvent or unable to meet his debts as they mature. A meeting of the farmer's creditors shall then be called by the conciliation commissioner who will prepare a final inventory of the farmer's estate.

In the case of the farmer, as in the case of other individuals, a composition or extension proposal must be accepted by a majority of creditors both in number and amount before the application for confirmation may be filed with the court. Provisions for confirmation and for the terms of extension proposal are the same as those in the case of other individuals.

The following proceedings may not be instituted at any time subsequent to the filing of a petition for composition or extension and prior to confirmation or other disposition by the court, except on petitions to and confirmation by the judge:

Proceedings for any demand, debt

or account; for foreclosure of a mortgage on land or for cancellation, recession or specific performance of an agreement for sale of land or for recovery of possession of land; to acquire title to land by virtue of any tax sale; for attachment or garnishment; to sell land in satisfaction of any judgment or mechanic's lien, seizure, distress, sale or other proceedings.

## Motors Decline 22 Per Cent in February

NEW YORK—The aggregate value of motor and accessory stocks listed on the New York Stock Exchange declined in February from \$1,073,569,660 to \$825,307,233, a drop of 22 per cent. This compares with an aggregate decline during February for all listed stocks of 15 per cent.

### F.I.A.T. to Make Twin Coach

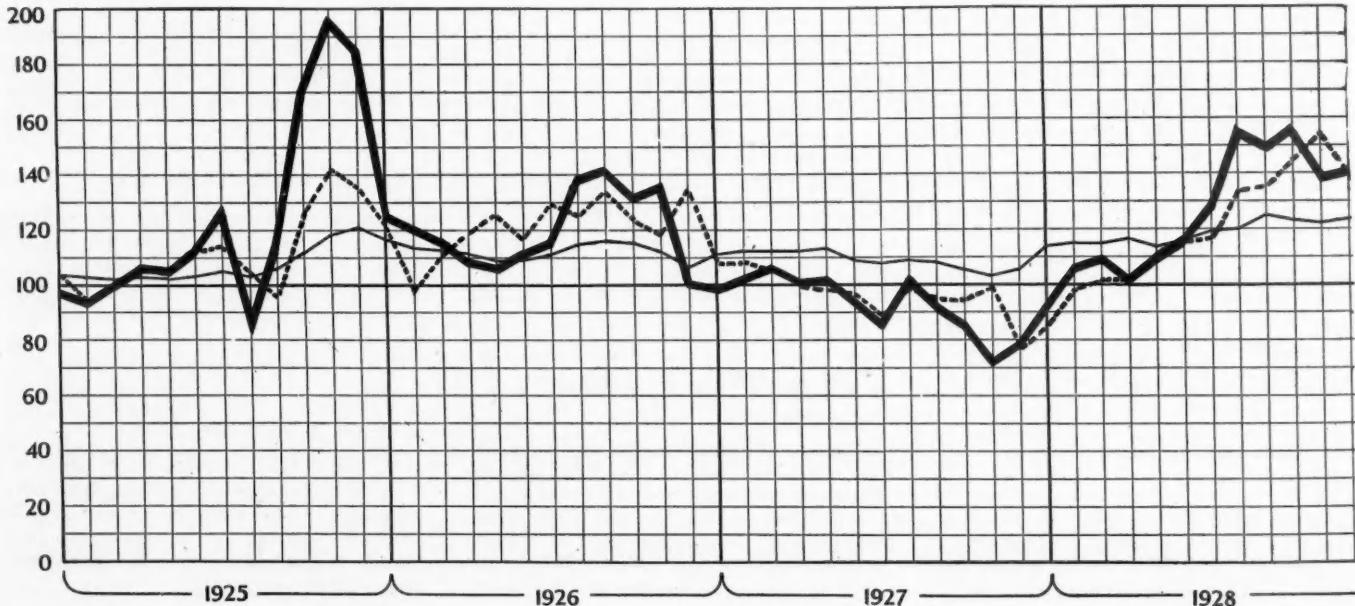
KENT, O.—Under terms of a manufacturing license agreement just consummated Fiat Societa Anonima of Turin, Italy, will manufacture Twin Coach buses, trolley buses and other products for sale in Italy and Southern Europe.

### Abandon Ford Bank Plan

DETROIT—Plans to organize new banks on the basis of the First National and the Guardian National Bank of Commerce, with the cooperation of Henry and Edsel Ford, have been abandoned.

### Eugene H. Griffith

DETROIT—Eugene H. Griffith, vice-president and general manager of the Ohio Rubber Co., died Wednesday at his home here.



### Gump Gets "348" Again

The celebrated automobile of Andy Gump will again carry plates No. 348. Gump's car wouldn't know itself without plates bearing those numbers. It has worn them so many years.

You've probably heard of Andy Gump. He's the comic strip character who has run for president, has run after the widow Zander and has run wild every time he's got a hand on any of Uncle Bim's millions. If you have, you've heard of the wrong Gump. We're speaking of E. A. Gump, of Pontiac, Mich., purchasing agent for the Wilson Foundry & Machine Co., a Willys-Overland subsidiary.

E. A. Gump several years ago decided he was the namesake of the cartoon character and determined to have license plates for his car bearing the famous "348" and was successful in getting them. For another year at least he will continue to boast of them, for Michigan has again acceded to his request.

### Ford Light Eight

DETROIT—Present indications are that the smaller Ford Eight will not be introduced before early summer. In fact, reports are current that its announcement may be deferred until fall.

### Maryland Sales Decline

BALTIMORE—Maryland registrations of new cars in February numbered 1186 against 1359 in the same month last year. Registrations of commercial vehicles were 180 against 225 a year ago.

## January Production Up 8 Per Cent from Last Year and 22 Per Cent from December

WASHINGTON, D. C.—January motor vehicle production in the United States and Canada amounted to 133,472 as compared with 123,075 a year ago, according to the Bureau of Census. The total is the largest since last June and marks the first time since December, 1930, that monthly output has exceeded the corresponding month of the previous year.

Car and truck production figures follow:

	January, 1932	January, 1931	Per Cent Change
Cars .....	111,818	101,915	+9
Trucks .....	22,154	21,160	+4
Total .....	133,472	123,075	+8

Production of N.A.C.C. manufacturers approximated 114,000 which would place the Ford total for the month at something under 19,000.

### N.E.M.A. Show Set For Chicago in October

(Continued from page 322)

complete displays of parts, accessories, tools, equipment and supplies, special emphasis will be placed upon actual demonstration of the products under working conditions together with practical suggestions and assistance in merchandising all forms of maintenance work.

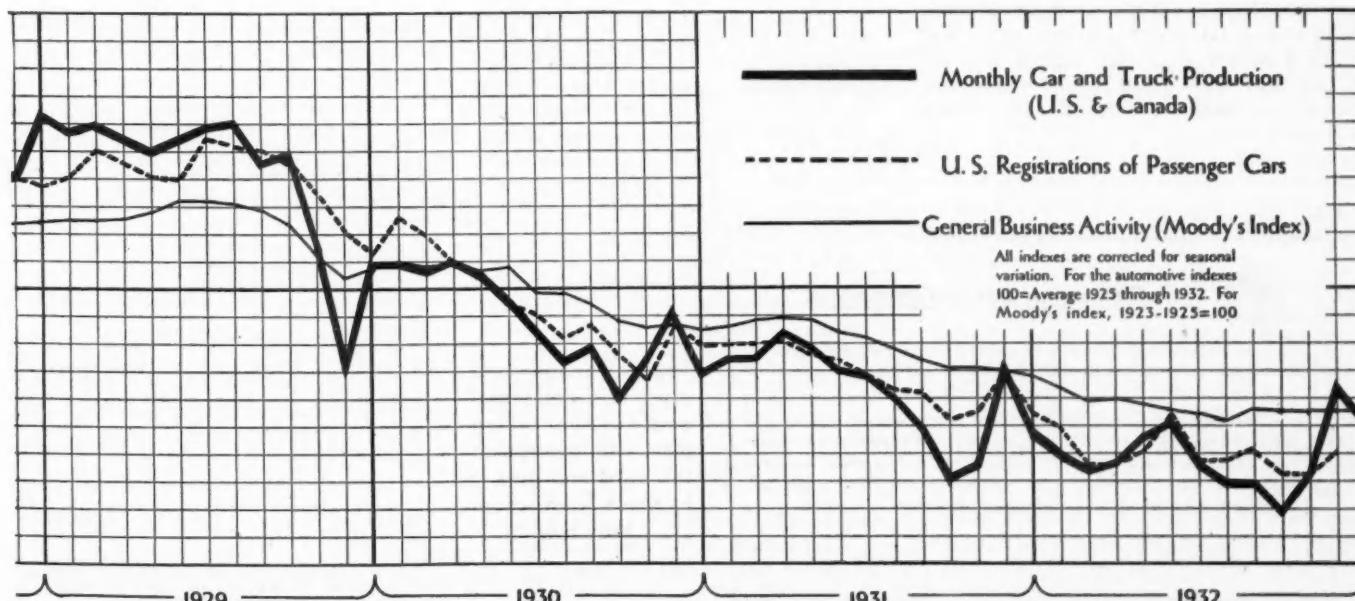
Recognized wholesalers of automotive products will be invited to attend the exposition on Oct. 23 and 24 while the show will be open during the balance of the week to all customers whom the exhibiting manufacturers care to invite. Members of the committee believe that the MEMA exposition can be made so broad and comprehensive that it will mean to the entire maintenance branch of the industry what the present national automobile show means to the vehicle manufacturers.

Officials of the Motor and Equipment Wholesalers Association already have assured the committee of their willingness to enlist the complete cooperation of the NEWA and its affiliated 19 regional wholesalers' associations.

The annual convention sessions of the MEMA will be held in conjunction with the exposition and the Hotel Sherman, directly across the river from the Merchandise Mart, has been selected as official headquarters.

### Martin to Handle Weatherhead Sales

SYRACUSE, N. Y.—W. F. Martin Co. has taken over the sales of the Weatherhead Company, Cleveland, manufacturers of brass pipe fittings, connections, shut-off cocks and drain cocks, for gasoline and oil line use in the automotive, hardware, refrigerator and oil burner trade throughout their entire United States and Canadian territory.



## Willys Gets Go Ahead on 4,400 IHC Trucks

### But Bank Holiday Forces Suspension of Operations

TOLEDO—Production of a minimum of 4400 trucks for International Harvester Co. by Willys-Overland Co. is permitted by a court order obtained by Receivers Willys and Miller. The receivers were authorized to issue not more than \$600,000 in receivers' certificates to finance the work, the money thus received to be kept separate and to be used for the manufacture of the trucks.

Due to the banking holiday, the receivers were unable to take advantage of the court's action as lack of cash made it necessary to suspend operations.

Judge Hahn said that the order for the trucks is on hand and that orders for an additional 2500 trucks have been accepted for March, April and May delivery, making a total of 6900 trucks.

Previously the court had withheld permission to make these trucks until assurance was received that income would exceed expense and that wages would not be reduced.

Prior to the suspension forced by the bank holiday, L. A. Miller said, employment was at the 1000 mark and would be increased to possibly 3000. Nothing has been said so far as to the possibility of resuming passenger car operations.

L. A. Miller, receiver, has extended his cooperation to the court in assisting the workmen of the plant to file their claims for wages due prior to the receivership. Under the arrangement a notice will be mailed to each workman. Those who have any corrections will have an opportunity to consult officials at the pay offices.

## William E. Carnegie

Detroit—William E. Carnegie, 54 years old, chief accountant of the Ford Motor Co., died March 8. He had been with Ford for 20 years and was in charge of the Brazil rubber development.

### "Siamesed" Fords

At the recent automobile show in Amsterdam, Holland, there was exhibited a motor truck known as the Siam which is built up of two Ford commercial chassis. From each engine a propeller shaft connects to the rear driving wheel on the same side. The object of the designer was to produce a vehicle of high tractive power (25 tons) which can be used either as a platform truck or a tractor. Another interesting exhibit was the first automotive Diesel engine built by the Dutch firm of Kromhout, under license from the British Gardner Co.

## Roosevelt Gets MEMA Legislative Program

### Association Seven-Point Program Also Forwarded to All State Governors

NEW YORK—The Legislative Committee of the Motor and Equipment Manufacturers Association, headed by David Beecroft, has forwarded a statement of the Association's views on legislation to President Roosevelt, Vice-President Garner and to the Governors of each of the 48 States.

The Association went on record as favoring the balancing of national, state and local budgets; a Federal turnover sales tax of not more than 1 per cent in the event additional revenue is needed; the elimination of capital gains and losses from personal income taxes and that, where such losses and gains are included, both be treated alike; discontinuance of direct government competition with private business; revision of bankruptcy laws; uniform state motor vehicle codes and a stoppage of the diversion of motor vehicle taxes from road funds.

## Steel Makers Set New Sheet Prices

### Smaller Automotive Demand Causes Operations Decline

NEW YORK, March 8—While the bank holiday caused a certain amount of slowing down in steel market activities, sentiment was decidedly cheerful, if not optimistic. Producers felt that the end of the "red ink" period was at last in sight and that more profitable price levels would now work themselves out on the basis of a change in all commodity values.

Operations in none of the steel making districts were in any way impaired by what difficulties in obtaining currency presented themselves following the closing of the banks, payroll and current expense funds being made available in one way or another. Operations, however, were lower than during the last week of February, due to lighter specifications from automotive consumers.

Official figures covering February, made public by the American Iron & Steel Institute on Monday, showed February output to have been at the rate of 20.39 per cent of capacity as compared with 17.78 per cent in January and 15.02 per cent in December.

Second quarter sheet prices are now uniformly quoted by all rollers on a \$1 per ton higher basis for hot-rolled and a \$1 per ton reduction in heavy cold-rolled. The new prices which are announced to apply strictly to new business will have no real test for some time to come, as regular customers will have the privilege to furnish specifications until the last day of this month for shipment in April.

Whatever interruption in fresh buying the bank holiday may have caused, it has served to intensify the conviction in the steel market that a large volume of demand overhangs the market and that this will begin to come out as soon as legislative emergency measures are out of the way.

**Pig Iron**—With February production statistics showing an increase of 7½ per cent over the preceding month, the temporary lull in buying caused by the bank holiday is confidently expected to be more than made up for by increased activity during the second half of the month.

**Aluminum**—Unchanged.

**Copper**—Exchange transactions suspended during the bank holiday.

**Tin**—The London market was a shade lower on Monday. Lacking the essential basis of a knowledge of the value of the Pound Sterling, the New York market for the first time in its history was without even nominal quotations. Tin is being shipped ex New York warehouse to consuming customers, price to be adjusted later.

**Lead**—In spite of the bank holiday a large business in lead was done by producers on Monday on a 3c., New York, basis.

**Zinc**—Except for shipments to regular customers, business in zinc was at a standstill early this week.



### Continental Motors Corporation

The patronage that comes from me and my family is made possible through compensation received from Continental Motors Corporation or from one of its subsidiary companies.

I am interested in increasing the business of my Company, and you can help me in my efforts to do so by using personally and in your business one or more automobiles manufactured by the Continental Automobile Company. Purchases of these automobiles by you and through your influence will help to make my job permanent and will be appreciated by me.

Signed \_\_\_\_\_

Address \_\_\_\_\_

The patronage card used in Continental employee car selling plan. Employees sign this card and give it to those from whom they buy.

## Earnings and Current Position

	Net income after Depr., Int., etc. 1932	Cash 12/31/32	Securities 12/31/32	Current Assets 12/31/32	Current Liabilities 12/31/32
Autocar Co. ....	d \$1,077,641	\$612,227	\$537,628	\$4,537,449	\$868,690
Chrysler Corp. ....	d 11,254,232	1,468,935	\$33,735,862	\$8,866,633	\$65,681,796
Hupp Motor Car Co. ....	d 4,515,482	d 4,249,128	2,577,936	2,325,851	7,283,420
Internat'l Harv. Co. ....	d 7,582,879	1,346,537	32,927,483	23,941,984	232,978,710
Armstrong Cork Co. ....	d 2,259,376	d 3,823,494	3,682,086	4,459,572	15,537,535
Bohn Alum. & Brass Corp. ....	d 720,568	295,333	.....	.....	.....
Borg-Warner Corp. ....	d 598,300	1,208,209	.....	12,673,847	1,117,634
Electric Auto-Lite. ....	1,364,058	3,913,833	.....	4,614,209	1,018,067
Johns-Manville Corp. ....	d 2,680,873	583,792	3,542,365	1,184,320	10,953,287
Logan Gear Co. ....	d 124,111	335,106	.....	.....	335,049
Marlin-Rockwell Co. ....	d 123,399	d 23,052	3,521,351	218,142	4,263,184
Midland St'l Pr. Co. ....	d 221,296	775,744	1,300,061	3,590,607	6,320,885
Mullins Mfg. Co. ....	d 696,108	100,094	.....	.....	117,985
U. S. Rubber Co. ....	d 9,617,646	d 9,042,066	12,303,473	187,943	48,228,363
					15,742,560

d Deficit.

## Houghton Takes Over Weaver Brothers' Line

PHILADELPHIA—E. F. Houghton & Co., with plants here and in Chicago and Detroit announce that they will manufacture and sell the products formerly made by Weaver Brothers Co., Cleveland. J. C. Weaver, formerly vice-president of the latter company, is now manager of the cleaner and pickling products department of E. F. Houghton & Co.

Weaver Brothers' products include pickling inhibitors, pickle pills for testing the strength of acid and alkaline solutions, Tanktite, a plastic, acid resisting lining for tanks, and several other well known products used in the pickling of all types of metals.

## Thurberator Demonstrated

NEW YORK—Equipment for burning furnace oil in gasoline engines, known as the Thurberator, has been installed on a six-cylinder sleeve-valve engine of a Yellow coach and was demonstrated here recently. The bus is now in daily operation in the business section of Newark, N. J. and the engine is said to have more power than when operating on gasoline, and shows a greater fuel mileage. The manufacturers of the device, the Thurberator Corporation, state that they are now developing it for application to rail cars, buses, trucks and tractors, and expect to be in production shortly.

## Louis C. Moore

LANSING—Louis C. Moore, 45, personnel director of Motor Wheel Corp., and recently connected with the welfare department of Olds Motor Works, died Wednesday morning in Ann Arbor, following an operation a few days ago.

## Bonbright With Sutton

DETROIT—George W. Sutton, Jr., president of Sutton and Schipper, Inc., New York, industrial news counsel representing numerous corporations and industrial associations, has announced that John M. Bonbright, formerly publicity director for Graham-Paige Motors Corp., is now associated with the firm's Detroit branch, established recently to handle the company's increased business in the automotive and accessories field.

## Carlson with Tung-Sol

NEWARK, N. J.—R. E. Carlson has joined the Tung-Sol Lamp Works, Inc., in the capacity of sales engineer, with headquarters in their Detroit Office, 4612 Woodward Avenue.

Mr. Carlson is well known to the industry, having spent the past ten years with the Bureau of Standards, Edison Lamp Works and Westinghouse Lamp Co.

## Moratorium on D.F.'s.

PHILADELPHIA—The story of the "smart" man who rushed into his bank Monday of the National emergency and demanded paper currency for his ten twenty dollar gold pieces because he was afraid "Uncle Sam was going off the gold standard" isn't the only exhibition of business ignorance and questionable caution.

One wholesaler here received two telegrams shortly after the national emergency was proclaimed. They were from competing manufacturers, both of whom distributed their merchandise through that jobber.

One telegram demanded immediate

## NSPA Urges Tight Credits for Holiday

### Jobbers Asked to Assist by Paying Present Debts to Parts Makers Promptly

DETROIT—Jobber members of the N.S.P.A. are urged to pay present indebtedness to manufacturers to the extent possible, in a bulletin issued by A. R. Sandt, director of marketing research. The bulletin points out that manufacturers are being advised by their suppliers that future shipments will be made for cash, or on very strict and limited credit terms, thus making it difficult for the manufacturers to meet payrolls, etc. It is also suggested that wholesalers limit purchases to those required immediately and for which they can pay C.O.D. or at the time agreed upon.

N.S.P.A. headquarters also has advised jobber-members to tighten up sharply on credits during the current banking emergency. The Association recommends that all charge customers should be placed in one of the following classifications:

C.O.D.—All customers who use you only because they cannot buy from their regular source.

Three-day note plan—All weak customers whose accounts are relatively small should be placed on C.O.D. or required to sign notes payable in three days.

Seven-day note plan—All customers who have been on a 30-day basis, if not placed on either of the two preceding bases, be required to give notes payable in seven days.

Open account—Sell on 10-day open account to concerns with gilt-edge credit.

The Association also urges careful watch of credits, further curtailment of expenses and the reduction of delivery service.

payment by postal money order for the merchandise on the wholesaler's shelves.

The other telegram told of the manufacturer's confidence in him and offered to advance money to meet the jobber's payroll during the emergency, if necessary.

"Well, mused the wholesaler after giving orders to crate up the first manufacturer's merchandise and send it back, "it just proves, I 'spose that what business needs most is a moratorium proclamation to silence dam-fools right now."

## Alcohol Fuel Bills Die With Congress

### Lame-Duck Session Fails to Act on Mixing Plans

PHILADELPHIA—Among the bills that died with the lame-duck Congress were two proposals, H. R. 14627-28, advocating the use of alcohol in engine fuels. Iowa also has two bills, Senate file No. 227 and No. 231, pending in committee on the same subject. The intent of such legislation is that internal combustion engine fuel is to be compounded of a mixture of gasoline and 10 per cent by volume of alcohol. Iowa proposes to establish or license alcohol distilleries which would produce alcohol for this purpose from farm products, chiefly corn and wheat. Compliance with the regulation would be enforced by imposing a special tax of five cents per gallon on gasoline without the alcohol.

According to petroleum technologists, the matter of adding alcohol to gasoline is not so simple as it sounds. The effect of alcohol upon carburetion, detonation, and the stability of the mixture are being studied. Some doubt is expressed concerning the real economic benefits of this move. The consensus is that the proposal if enacted will result in a marked increase in the retail price of motor vehicle fuel.

## Canada Halves Imports

OTTAWA—January imports of automobiles from the United States dropped to 92 as compared with 181 a year ago. Imports from the United Kingdom amounted to 12 vehicles against none from that source in January, 1932.

## January Aircraft Exports

WASHINGTON, D. C.—Aircraft exports in January numbered 56 and had a value of \$634,139. In the same months 575 engines valued at \$85,920 were exported.

## Ludlum Names Sherman

WATERVLIET, N. Y.—Ludlum Steel Co. announces that Coolidge Sherman has been appointed assistant general sales manager.

Mr. Sherman was formerly assistant to the president.

## Riordan Machinery Appointed

MILWAUKEE, WIS.—The Riordan Machinery Co., 213 Curtis Bldg., Detroit, has been appointed to represent Davis-Thomas & Co. in the Detroit area, succeeding the Cadillac Machinery Co.

March 11, 1933

## Hudson Behind on Orders

DETROIT—Hudson-Essex production, delayed in early February by the body plant strike, reached a total for February closely approximating January figures, with the company approximately 800 cars behind dealers' orders as of March 1, indicating further step-up in production at least for the opening weeks of March.

## Packard Sales Up

DETROIT—Actual retail deliveries of Packard cars in the first 20 days of February exceeded those of the first 20 days of February last year by 20 per cent, it has been announced by M. M. Gilman, vice-president of distribution of the Packard Motor Car Co.

## Willis Heads Sales For Bendix Products

SOUTH BEND, IND.—Frank B. Willis has been appointed vice-president in charge of sales of the Bendix Products Corp., South Bend subsidiary of Bendix Aviation Corp.

"The naming of Mr. Willis as director of sales of the products corporation is another step in the unification and coordination plan now being effected by the parent corporation," the announcement states. It brings together under one direction the sales activities of The Bendix Brake Company, Bragg-Kliesrath Corporation, Bendix-Stromberg Carburetors, Bendix-Cowdrey Brake Tester, and the Aviation Wheel Division.

Mr. Willis entered the automotive industry in 1899 and has served in practically every branch of motor-



Frank B. Willis

dom. In 1928 he became associated with the Bragg-Kliesrath Corp., then located in Long Island City. When that corporation became a member of the Bendix Aviation Corp. family in 1931, Mr. Willis moved to this city and has been director of sales of the B-K division since that time.

## Chrysler Shows 1932 Loss of \$11,254,232

### Strong Cash Position Maintained—Omits 25c Dividend on Common

DETROIT—Coincident with the release of its 1932 statement showing a net loss of \$11,254,232 against a profit of \$1,468,935 in 1931, the Chrysler Corp. omitted the quarterly common dividend of 25 cents a share. After dividends of \$4,390,243 paid in 1932, the deficit for the year was \$15,644,475.

Sales last year were \$136,546,522 as compared with \$183,805,104 in 1931. Current assets at the year end were \$65,681,796, including cash and marketable securities of \$42,602,494, against current liabilities of \$16,395,380.

In connection with the change in the corporation's capital stock from no-par to \$5 par, \$51,041,668 was transferred from capital to capital surplus. Subsequently, the creation of a reserve of \$24,999,999 out of capital surplus was authorized to write down the good-will item heretofore carried at \$25,000,000 to \$1.

At the year end, capital and capital surplus amounted to \$47,744,183 compared with \$73,122,488 a year previous. Earned surplus was \$27,372,720 on Dec. 31 against \$43,017,196 at the end of 1931.

## A Correction

On page 223 of the Statistical Issue of *AUTOMOTIVE INDUSTRIES* appears the table of sales of passenger cars by makes with per cent of total sales and the rank of the various makes for the past four years. Through an error the data for Pontiac and Oldsmobile cars has been transposed for the year 1932. The correct figures should read:

	Per Cent of Sales	Total	Rank
Pontiac . . . . .	49,920	4.38	5
Oldsmobile . . . . .	24,120	2.20	11

## Guba With Carnegie

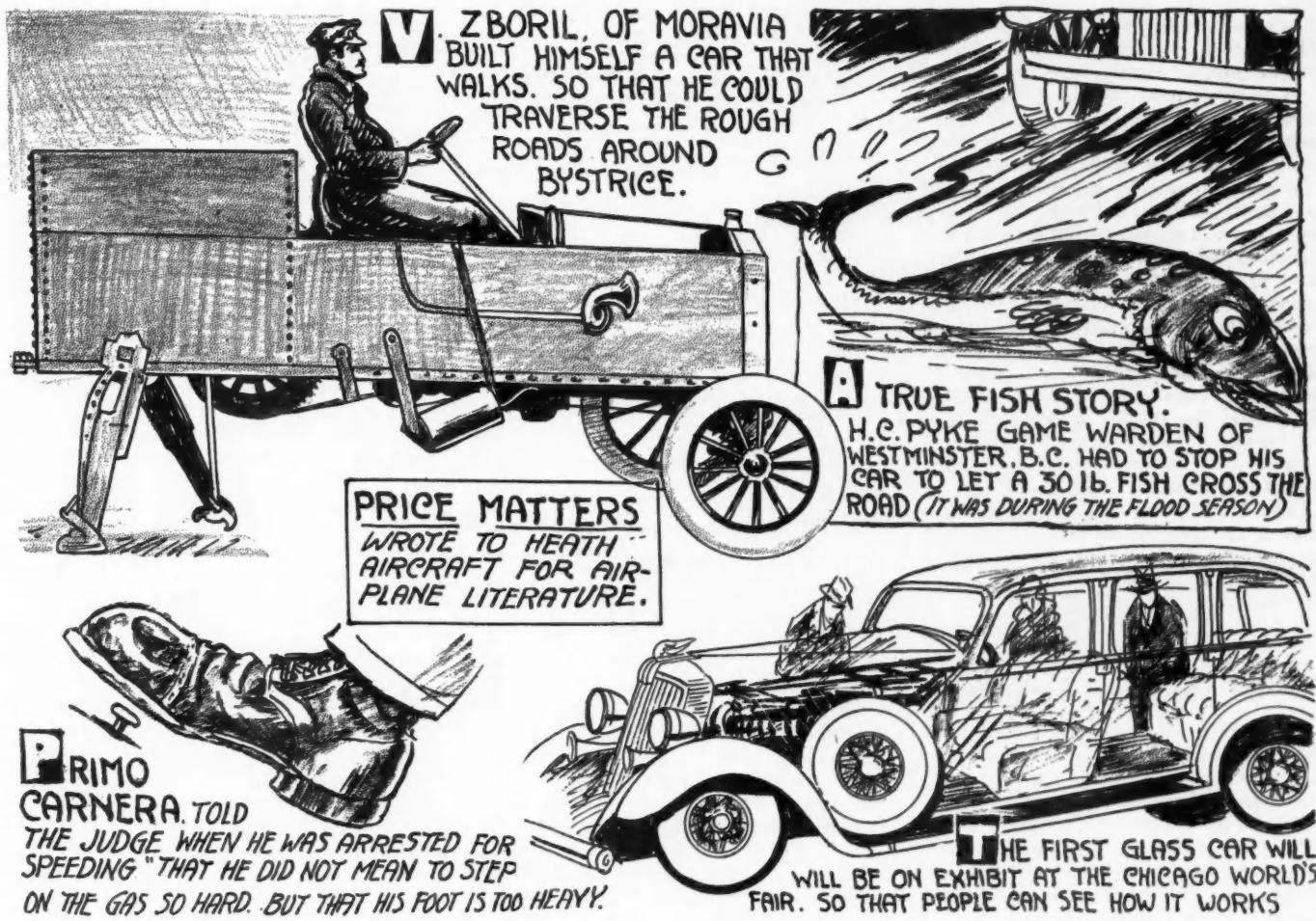
NEW YORK—Philip M. Guba, who has been assistant manager of sales of the Republic Steel Corp. in New York, has been appointed assistant manager of sales in Detroit by the Carnegie Steel Co., subsidiary of the United States Steel Corp., effective March 1.

## Griffith Joins Smith Mfg. Co.

ROCHESTER, N. Y.—Eddie Griffith, well known in the automotive industry and active in the affairs of the Society of Automotive Engineers, has been appointed factory representative for the F. A. Smith Mfg. Co., Inc., of Rochester, N. Y.

# Automotive Oddities—By Pete Keenan

Write us if you know an Oddity



**PRIMO CARNERA** TOLD THE JUDGE WHEN HE WAS ARRESTED FOR SPEEDING "THAT HE DID NOT MEAN TO STEP ON THE GAS SO HARD. BUT THAT HIS FOOT IS TOO HEAVY."

THE FIRST GLASS CAR WILL BE ON EXHIBIT AT THE CHICAGO WORLD'S FAIR. SO THAT PEOPLE CAN SEE HOW IT WORKS

## Macon Trial Flight Set for March 21

AKRON—First flight of the U. S. Navy's Airship Macon, now nearing completion here by the Goodyear Zeppelin Corporation, has been set for March 21 from the Akron Municipal Airport. Captain Alger H. Dresel, will command the new air liner. After completing the trial flights in this vicinity, the Macon will fly across the continent to the naval air station at Sunnyvale, Cal.

## John Long Brings Out New Book

NEW YORK—A contribution to the history of a horse-drawn era, is made this week by a member of the automobile fraternity in the publication of Lord Jeffery Amherst, "A Soldier of the King," by J. C. Long. Mr. Long was with the National Automobile Chamber of Commerce for ten

years and is now manager of publications and director of advertising for Bethlehem Steel Corporation. In addition to newspaper and general magazine contributions, he has written frequently for automobile magazines over a period of years.

## Linn Adopts Cummins Diesel

COLUMBUS, IND.—According to a recent announcement, the Linn Manufacturing Corp., Morris, N. Y., makers of heavy duty road building machinery, has adopted the Cummins 6-cyl. engine for all diesel-powered units. This brings the total of American manufacturers who have adopted the Cummins Diesel, to 14.

## New Borg Auto Radio

A new automobile radio set has been announced by the George W. Borg Corp., 469 E. Ohio St., Chicago, Ill. It will be known on the market as the Hobbs auto radio.

## Graham Deliveries Up 36 Per Cent

DETROIT—Retail deliveries of Graham sixes and eights throughout the United States during February showed a 36 per cent increase over those of January, it was announced today by R. C. Graham, vice-president, Graham-Paige Motors Corporation.

An even greater gain was revealed in the company's export business, February shipments abroad being reported by Mr. Graham as 41 per cent ahead of those for January. It also was announced that the combined export shipments for the months of January and February showed an increase over those for the comparative period of 1932.

## Chevrolet Production

DETROIT—Production of Chevrolet Motor Company during February is estimated at approximately 46,000 units.

## Marmon Herrington Gets New Order From Iraq

INDIANAPOLIS—The Marmon-Herrington Co., Inc., of Indianapolis, has received a large additional order from the Iraq Petroleum Company for giant 50-ton pipe carrying units. Each unit will consist of a Marmon-Herrington six-wheel-drive truck-tractor with semi-trailer and trailer.

The equipment just ordered will be similar in design to the original equipment except that improvements will increase the pipe-carrying capacity of each unit by approximately 25 per cent. The new units will consist of six-wheel-drive, heavy duty truck-tractors equipped with semi-trailers and trailers. Each will have a capacity of hauling upward of 50 tons of 10 and 12-in. steel pipe at a top speed of approximately 30 miles an hour. The units will weigh some 20 tons each and will have 30 wheels. They will be 100 ft. long, will have 12 speeds forward and four reverse and will be equipped with Westinghouse air brakes.

Mr. Herrington said that production of the new units will go forward as rapidly as possible with present indications pointing to a completion of the entire order in 90 days.

## Detroit Stamping Licensed

DETROIT—It is announced that the Detroit Stamping Co., Detroit, has been licensed to produce stampings by the low-cost "short run process" described in *Automotive Industries*, Feb. 11. The process is intended for small requirements from 100 to 500 stampings, and not exceeding 2,000 pieces. It is said to involve novel principles of die construction and hardening which save time in layout and the building of dies. This company will handle the needs of the Detroit area. The process is being licensed by the Continental Machine Specialties, Inc., Minneapolis, Minn.

## Durant Probes Causes Of Business Depression

NEW YORK—A questionnaire to determine which of the country's current problems is most pressing has been mailed to a list of business and professional leaders by William C. Durant, automobile manufacturer, the *New York Times* reports. The replies will be made public.

Just one query, cast in the form of a hypothetical question, was contained in Mr. Durant's letter:

"In the event that you were in complete control and vested with absolute authority, which one of the many national problems now confronting us would you consider the most important and requiring your immediate and undivided attention?"

March 11, 1933

## CALENDAR OF COMING EVENTS

### MEETINGS

National Machine Tool Builders Assoc. Annual Meeting, Cleveland, April 24-25

American Welding Society, Annual Meeting, New York City, April 27-28

U. S. Chamber of Commerce Meeting, Washington, D. C., May 2-5

American Society for Testing Materials, Chicago, June 26-30

National Metal Congress, Detroit, Oct. 2-6

American Welding Society, Fall Meeting, Detroit, Mich., Oct. 2-6

### CONVENTIONS

Middle Atlantic Automotive Jobbers, Washington, D. C., April 24-25

## British Makers Agree On Announcement Date

No Introductions of 1934 Programs Before Aug. 15

WASHINGTON, D. C.—New car programs for the 1934 season will not be announced by British motor manufacturers until after Aug. 15, 1933, according to the terms of an agreement recently concluded by the Society of Motor Manufacturers and Traders and leading British producers of motor vehicles, according to a report to the Commerce Department's Automotive Division from Trade Commissioner W. L. Kilcoin, London.

Individual models may be announced by the manufacturers at any time during the year under the terms of the new agreement but complete new programs for the coming season, usually announced during the previous year, will not be made public by any of the British producers until Aug. 15, 1933.

The new agreement only includes the program for private passenger cars and does not restrict the production of new trucks or other vehicles, the report states.

## Welding Conference Held

COLUMBUS, O.—The second annual welding conference and exposition was held Feb. 23 and 24, under the auspices of the department of industrial engineering of the Ohio State University. Among the speakers were, G. N. Sieger of P. R. Mallory, R. F. Helmkamp of The Air Reduction Sales Co., and H. O. Westendarp of General Electric. Short talks were given by John Younger, E. A. Hitchcock, and J. L. Morrill of the University.

## Hupp Reports 1932 Net Loss of \$4,515,482

DETROIT—Hupp Motor Car Corp. reports net loss of \$4,515,482 for 1932, against \$4,249,128 in 1931, after depreciation, etc. Current assets on Dec. 31 amounted to \$7,283,420, including \$4,903,786 cash and government securities, against current liabilities of \$1,074,133.

Net sales were \$8,750,565, against costs of \$11,309,077. Including "other income" of \$147,630, the loss before depreciation and other adjustments, was \$2,410,882 which corresponds with a loss on a similar basis of \$406,433 in 1931.

## Two New Hilo Directors

NEW YORK—At the annual meeting of the Hilo Varnish Corp., on February 16, 1933, Theodore H. Kleine and Patrick B. Healy were elected to the board of directors. Mr. Kleine has been connected with Hilo since 1912 during all of which time his activities have been in the credit department of which he is now manager. Mr. Healy is an attorney with offices in Boston and New York. He is a son-in-law of the late John H. Schumann, former chairman of the board of Hilo Varnish Corporation.

## Fleming Plant Moves

TOWSON, MD.—All manufacturing operations of the Fleming Machine Co., Worcester, Mass., have been transferred to the plant of the parent company, the Black & Decker Mfg. Co. of this town. The transfer does not involve any change in the Fleming line.

## Belgian Ford Shows Profit

Ford Motor Co. of Belgium has a net profit of 12,849,000 Belgian francs after charges in 1932 against 22,932,000 francs in 1931. The corresponding dollar figures are approximately \$1,800,000 and \$3,200,000 respectively.

## Ford Sets Schedule At 1600 Eights Daily

DETROIT—Assembly of the new Ford line, it is reported, is being confined to plants at Chester, Pa., Chicago, Dearborn, Mich., Edgewater, N. J., Louisville, Ky., Richmond, Cal., Summerville, Mass., and Kansas City. Twelve of the remaining branches are functioning as sales and parts offices, while twelve more are simply sales offices. Operations at Charlotte, Columbus and Portland have been discontinued temporarily.

Each of the eight branches assembling cars are understood to be scheduled for a maximum of 200 cars daily, making a total of 1600. If demand exceeds this total, additional branches will start assembly where the increase takes place.

Automotive Industries

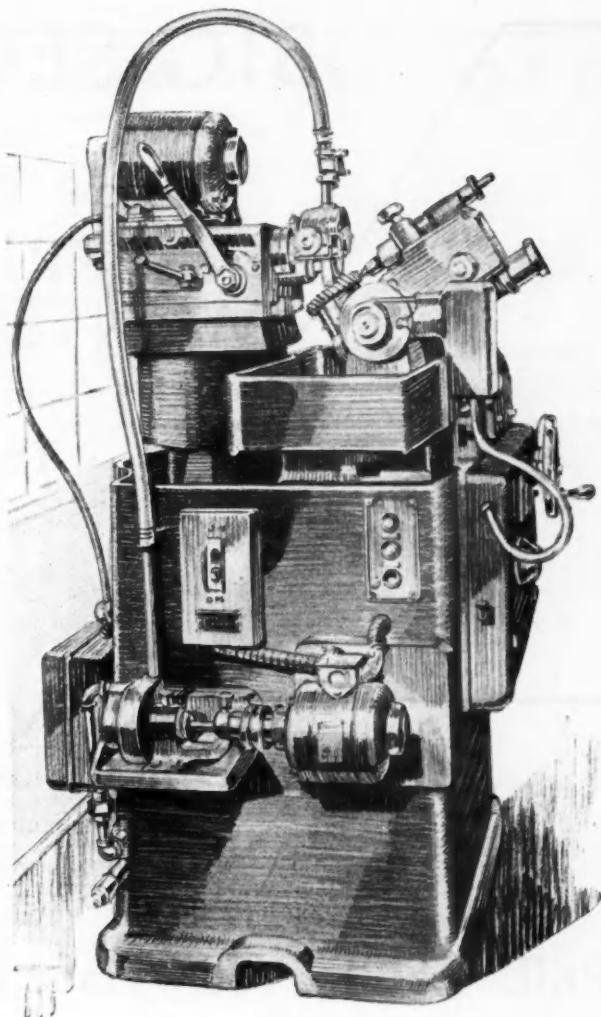
**WHEN  
YOU WANT  
CONSISTENT  
RESULTS...**

*Use* Fellows Helical  
Gear Shaper Cutters

*plus*  
Fellows Automatic  
Cutter Sharpening  
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**FELLOWS**  
~ GEAR SHAPER ~  
METHODS



**T**O temporize with a cutter holding fixture on an ordinary tool grinder is poor economy as compared with:

- (1) the positive control and high degree of accuracy possible with the Fellows Automatic Helical Cutter Sharpening Machine.
- (2) the speed with which it does the job, and
- (3) the longer life you realize from each cutter.

With the Fellows Helical Cutter Sharpening Machine you restore dull cutters to their original accuracy, and enable the Gear Shaper on which they are used to do precision work. Anything less involves a waste of money—in reject losses, noisy assemblies, etc. . . .

Equip for the highest attainable accuracy and you will save money in the long run. Complete your Gear Shaper layout with a Fellows Helical Cutter Sharpening Machine.

For Details, write: The Fellows Gear Shaper Company, Springfield, Vermont (or Detroit Office: 616 Fisher Building).

The Fellows line includes: GEAR SHAPERS and GEAR SHAPER CUTTERS, THREAD GENERATORS, HELICAL CUTTER SHARPENING MACHINE, RED LINER, GEAR MEASURING MACHINE, and GEAR and WORM LAPPING MACHINES.

# BIG SECTION

on  
**How To Sell**  
**SPRING**  
**MAINTENANCE**  
 In  
 The

## AUTOMOBILE TRADE JOURNAL

Spring Maintenance Number

and

1933 SERVICE MANUAL

**APRIL ISSUE—Your Trade Will Use It for A YEAR**

Eight separate articles, each featuring one of the following classes of maintenance:

- (1) Carbon, valves and motor tune-up;
- (2) Electrical Service;
- (3) Brakes;
- (4) Appearance Maintenance;
- (5) Radiators;
- (6) Tires;
- (7) Motor Overhaul;
- (8) Lubrication.

LISTING the shop equipment, tools and materials required in each operation—and after-market merchandise.

Here is the greatest current opportunity for manufacturers to close up sales!

**Give Her The Gas In April!**

**AUTOMOBILE TRADE JOURNAL**

*A Chilton Publication*

Chestnut and 56th Sts., Philadelphia, Pa.

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SALISBURY Axles have acquired a reputation for silent running heretofore unattained in passenger car axles. Due to rigidity in construction and unusual accuracy in manufacture and assembly, the gears are maintained in their original position thus eliminating the necessity of the customary service adjustments.

All axles are assembled and tested by the use of micrometer type fixtures and gauges which assure the selection of the best operating position for long life and quiet operation.

**Spicer**

MANUFACTURING CORPORATION  
TOLEDO, OHIO

BROWN-LIPÉ  
CLUTCHES and  
TRANSMISSIONS

SALISBURY  
FRONT and REAR  
AXLES

SPICER  
UNIVERSAL  
JOINTS

PARISH  
FRAMES  
READING, PA.

## IS IT NEW?... *but above all* IS IT IMPORTANT?

These are the twin standards by which articles appearing in *Automotive Industries* are selected. The importance of the men who read the publication makes such selection of paramount interest to them. The readers of *Automotive Industries* are key men in automotive plants; men who control purchasing power. They favor an automotive publication which is terse, accurate, dependable. *Automotive Industries* meets the needs of such men in hundreds of automotive manufacturing plants in the United States and in more than a score of foreign countries.

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Thirty-fourth  
year

*A Chilton Publication*

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DILECTO Insulating sheets, rods, tubes and special shapes.  
Also CELORON Timing Gears and Diamond Vulcanized Fibre.  
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COMPLETE FORGING EQUIPMENT  
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DRILLING : BORING and TAPPING EQUIPMENT  
A complete line including gear or hydraulic feed, single or multiple spindle; vertical, horizontal and way type.  
BAKER BROTHERS, INC. TOLEDO, OHIO

# BUYERS' GUIDE

Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Page 39

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Air Cleaners A.C. Spark Plug Co.	Bushings <i>Fibre</i> Continental-Diamond Fibre Co.	Crankshafts Atlas Drop Forge Co.	Furnaces, Electric (Annealing, Carburizing, Heat Treating, Forging & Welding) Electric Furnace Co.	Heat Treating Barnes-Gibson-Raymond, Inc. Barnes, Wallace Co. Gibson, Wm. D., Co.
Ammeters General Electric Co.	Cable, Brake or Cutout Control Wickwire Spencer Steel Co.	Cups, Lubricating Gits Bros. Mfg. Co.	Gages A.C. Spark Plug Co.	Hoods Motors Metal Corp.
Arms & Knuckles, Steering Atlas Drop Forge Co.	Cable, Ignition, Starting & Lighting General Electric Co.	Cutters Baker Brothers, Inc. (Keyseating) Fellows Gear Shaper Co. (Gear)	Gaskets <i>Felt</i> American Felt Co.	Hose, Flexible Metallic (Radiator & Fuel Lines) Titeflex Metal Hose Co.
Axes Atlas Drop Forge Co. Spicer Mfg. Corp.	Camshafts Atlas Drop Forge Co.	Drilling Machines Baker Brothers, Inc. Foote-Burt Co.	Gear Cutting Machines Fellows Gear Shaper Co. (Shapers)	Insulating Material Continental-Diamond Fibre Co.
Bending & Straightening Machines Chambersburg Engineering Co. Chambersburg-National Co. National Machinery Co.	Carburetors Bendix Aviation Corp.	Enamels American Chemical Paint Co. (Rust Proofing)	Gear Material <i>Non-Metallic</i> Continental-Diamond Fibre Co.	Keyseaters Baker Brothers, Inc.
Blanks Forged Atlas Drop Forge Co.	Channels for Glass <i>Felt</i> American Felt Co.	Felt American Felt Co.	Gears, Timing <i>Non Metallic</i> Continental-Diamond Fibre Co. General Electric Co.	Lapping Machines Fellows Gear Shaper Co.
Boring Machines Baker Brothers, Inc. Foote-Burt Co.	Cleaners <i>Metal</i> American Chemical Paint Co. (Rust Preventive)	Fenders Motors Metal Corp.	Grinding Machines Fellows Gear Shaper Co.	Lathes <i>Automatic Chucking</i> Potter & Johnston Machine Co.
Brake Testers Bendix Aviation Corp.	Connecting Rods Atlas Drop Forge Co.	Fibre, Rods, Sheets, Tubes Continental-Diamond Fibre Co.	Hammers, Power Chambersburg Engineering Co. Chambersburg-National Co. National Machinery Co.	<i>Turret</i> Potter & Johnston Machine Co.
Brakes <i>Mechanical</i> Bendix Aviation Corp. Spicer Mfg. Co.	Counters Veeder-Root, Inc.	Filters, Oil A.C. Spark Plug Co.	Lighting Equipment, Electric Factory General Electric Co.	Lubricators, Chassis Gits Bros. Mfg. Co. Turn to page 38, please
Power Bendix Aviation Corp.	Couplings, Shaft Spicer Mfg. Corp.	Forgings Atlas Drop Forge Co.		

# Colloidal Graphite



*A lubricant  
not a  
lapping  
compound*

THE seemingly smooth - yet amazingly rough - surfaces of new shafts, guides, bearings, etc., require maximum lubrication during their early life.

It is important, therefore, that these parts are not only "run-in" with colloidal-graphited oils, but that lubricants containing colloidal graphite be applied during assembly.

This practice hastens the formation of graphoid surfaces which discourage oil film rupture, minimize seizure and scoring, provide lubrication in the absence of oil and shorten the time required for "limbering-up".

Send for Technical Bulletins 113 and 200.

## ACHESON OILDAG CO.

Manufacturers of Colloidal Graphite Products

PORT HURON, MICH.



Send your sales message to the world's richest industrial market through the advertising pages of

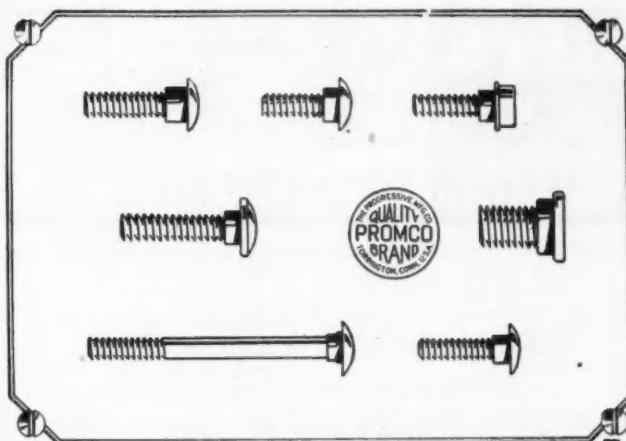
## Automotive Industries

A CHILTON PUBLICATION

Chestnut and 56th Streets  
Philadelphia

"AUTOMOTIVE HEADQUARTERS"

Automotive Industries



## MACHINE SCREWS MACHINE SCREW NUTS

*In Stock at All Times*

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Their advice may prove of mutual advantage. Get in touch with us.

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*The illustration indicates a few of the many special parts that we have developed for other manufacturers*

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Records truck or bus mileage with the necessary accuracy to show costs-per-mile and control them. Proves the mileage-performance of different jobs; helps operator to get more mileage for his money. Comparative records of trucks or busses show up careless or wasteful handling; check up on drivers' efficiency.

At right: regular model, adaptable to all standard trucks or busses. Special model for FORD commercial cars, complete with threaded hub for attaching.



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Veeder-ROOT INCORPORATED  
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March 11, 1933



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 Oil and Grease Cups  
 Oil and Grease Seals  
 Automatic Multiple Oilers

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 DUST SHIELDS  
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Heavy, medium and light stampings in any quantity. A steady flow of production—when you want it.

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Single and multiple spindle special drilling, boring, reaming, tapping machine and FOOTBURT Sipp Sensitive Drilling Machines THE FOOTE-BURT COMPANY CLEVELAND, OHIO

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 BY **ATLAS**  
 27<sup>TH</sup> YEAR  
 DROP FORCE CO. LANSING MICH.

## BUYERS' GUIDE—Continued

(Continued from page 36)

**Molded or Machined Parts (Phenoic)**  
 Continental-Diamond Fibre Co.

**Motors, Electric Power**  
 General Electric Co.

**Odometers**  
 Veeder-Root, Inc.

**Oil**  
*Brake In*  
 Acheson Oildag Co.  
*Lubricating*  
 Acheson Oildag Co.

**Pads**  
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 American Felt Co.

**Panels, Instrument**  
 American Chemical Paint Co. (Heat Resisting)

**Panels, Instrument**  
 A.C. Spark Plug Co.

**Pickling Compounds**  
 American Chemical Paint Co.

**Piston Rings**  
 Perfect Circle Co.

**Plugs, Spark**  
 A.C. Spark Plug Co.

**Powerplants, Industrial**  
 General Electric Co.

### Presses

Chambersburg Engineering Co.  
 Chambersburg-National Co.  
 National Machinery Co.

### Pumps, Fuel

A.C. Spark Plug Co.

### Radiator Shells

Motors Metal Corp.

### Removers, Enamel & Paint

American Chemical Paint Co.

### Rivets

Progressive Mfg. Co.

### Running Boards, Metal

Motors Metal Corp.

### Rust Removers & Preventives

American Chemical Paint Co.

### Screw Machine Products

Barnes, Wallace Co.  
 Progressive Mfg. Co.

### Screw Machines

Potter & Johnston Machine Co.

### Screws

*Machine*  
 Progressive Mfg. Co.

### Shafts, Axle, Propeller & Transmission

Spicer Mfg. Corp.

### Silencers, Carburetor Intake

A.C. Spark Plug Co.

### Special Machinery

Baker Brothers, Inc.

### Speedometers & Tachometers

A.C. Spark Plug Co.

### Springs

*Extension, Compression, Torsion or Flat*

Barnes-Gibson-Raymond, Inc.  
 Barnes, Wallace Co.  
 Cook Spring Div.  
 Gibson, Wm. D., Co.  
 Raymond Mfg. Co.  
 Wickwire Spencer Steel Co.

### Stampings or Drawings, Metal

Barnes-Gibson-Raymond, Inc.  
 Barnes, Wallace Co.  
 Cook Spring Div.  
 Gibson, Wm. D., Co.  
 Motors Metal Corp.  
 Raymond Mfg. Co.  
 Wickwire Spencer Steel Co.  
 Worcester Stamped Metal Co.

### Starter Drives

Bendix Aviation Corp.

### Steam Cooling

Rushmore Laboratory

### Steel

*Alloy*  
 Illinois Steel Co.  
 Republic Steel Corp.

### Bars

Illinois Steel Co.  
 Republic Steel Corp.

### Billets

Illinois Steel Co.

### Carbon

Illinois Steel Co.  
 Republic Steel Corp.  
 Wickwire Spencer Steel Co.

### Cold Drawn

Republic Steel Corp.  
 Wickwire Spencer Steel Co.

### Electric Furnace

Illinois Steel Co.

### Shapes

Illinois Steel Co.  
 Wickwire Spencer Steel Co.

### Spring

Barnes-Gibson-Raymond, Inc.  
 Barnes, Wallace Co.  
 Gibson, Wm. D., Co.

### Stainless

Illinois Steel Co.  
 Republic Steel Corp.  
 Wickwire Spencer Steel Co.

### Strip

Illinois Steel Co.  
 Republic Steel Corp.  
 Wickwire Spencer Steel Co.

### Tapping Machines

Baker Brothers, Inc.  
 Foote-Burt Co.

### Thread Generators

Fellows Gear Shaper Co.

### Tubing

*Brass & Copper*  
 Bundy Tubing Co.

### Flexible Metal

Titeflex Metal Hose Co.  
*Welded Steel*  
 Bundy Tubing Co.

### Turret Machines, Automatic

Potter & Johnston Machine Co.

### Universal Joints

Spicer Mfg. Corp.

### Washers

*Felt*  
 American Felt Co.

### Welders, Electric

General Electric Co.

### Welding, Hydrogen-Electric

Bundy Tubing Co.

### Welding Material (Wires)

Wickwire Spencer Steel Co.

### Wicks

*Felt*  
 American Felt Co.

### Wire

*Flat, Round, Square or Special Shape*  
 Barnes, Wallace Co.

### Spring

Barnes, Wallace Co.  
 Republic Steel Corp.  
 Wickwire Spencer Steel Co.

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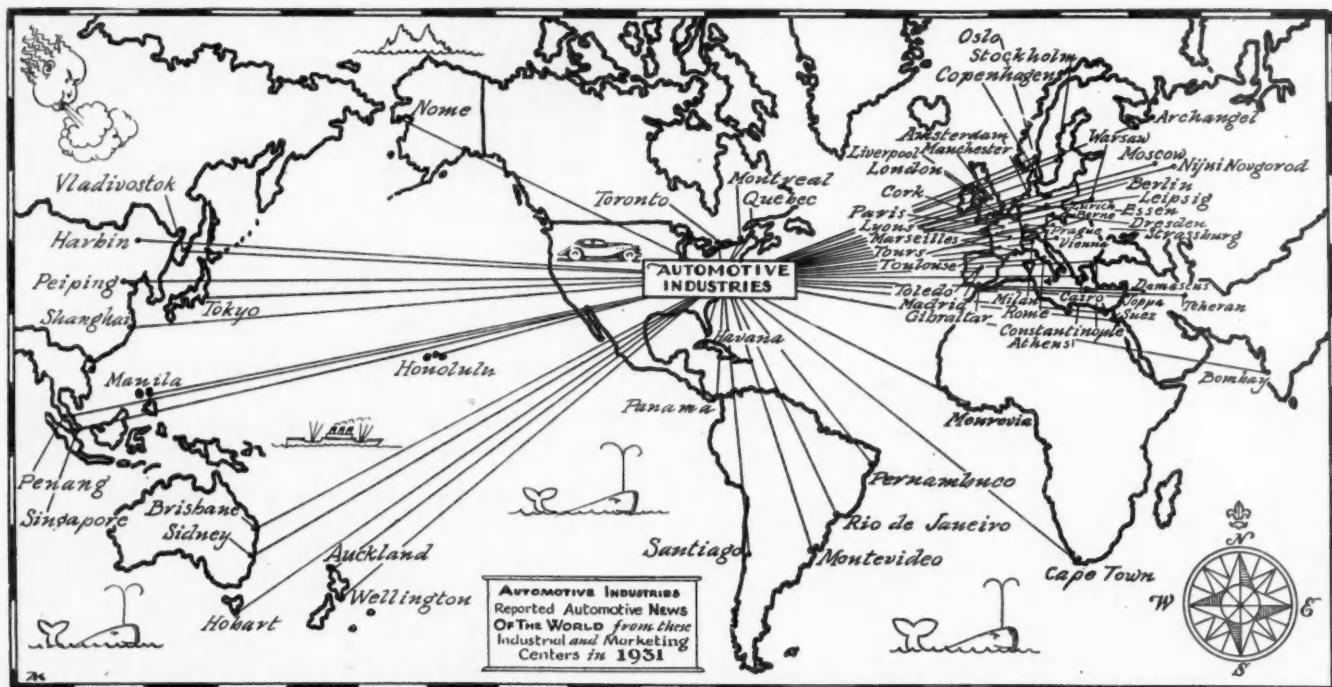
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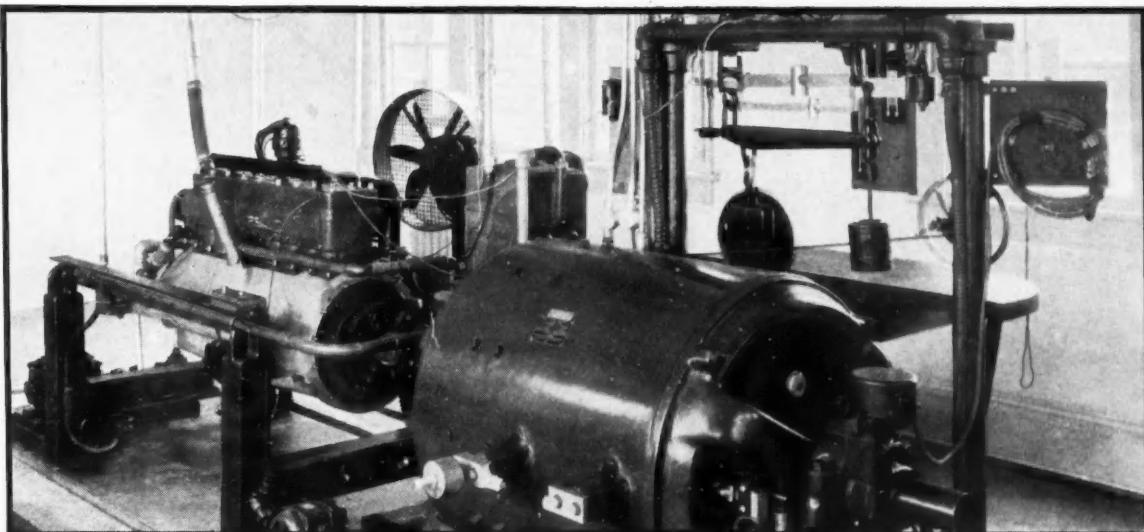
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